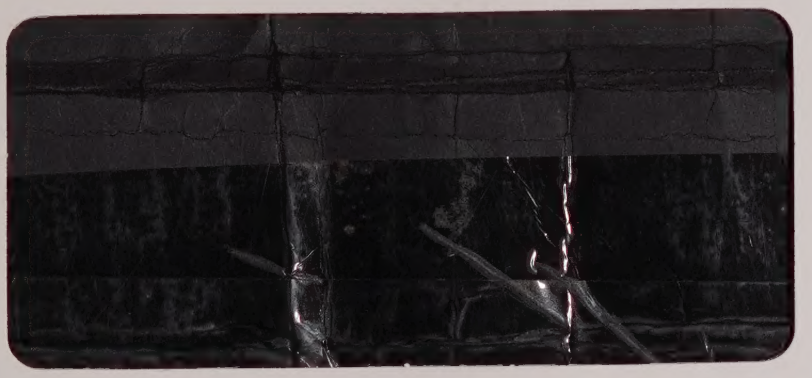
MAINTENANCE MANUAL



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Location:- B2
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TWO-TONE GENERATOR

RACAL-DANA

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LETHAL VOLTAGE WARNING

VOLTAGES WITHIN THIS EQUIPMENT ARE SUFFICIENTLY HIGH TO ENDANGER LIFE.

COVERS MUST NOT BE REMOVED EXCEPT BY PERSONS QUALIFIED AND AUTHORISED TO DO SO AND THESE PERSONS SHOULD ALWAYS TAKE EXTREME CARE ONCE THE COVERS HAVE BEEN REMOVED.

RESUSCITATION

TREATMENT OF THE NON-BREATHING CASUALTY

1 SHOUT FOR HELP. TURN OFF WATER, GAS OR SWITCH OFF ELECTRICITY IF POSSIBLE

Do this immediately. If not possible don't waste time searching for a tap or switch.

2 REMOVE FROM DANGER: WATER, GAS, ELECTRICITY, FUMES, ETC.

Safeguard yourself when removing casualty from hazard. If casualty still in contact with electricity, and the supply cannot be isolated, stand on dry non-conducting material (rubber mat, wood, linoleum).
Use rubber gloves, dry clothing, length of dry rope or wood to pull or push casualty away from the hazard.

3 REMOVE OBVIOUS OBSTRUCTION TO BREATHING

If casualty is not breathing start ventilation at once.

LOOSEN NECKWEAR
TILT HEAD BACKWARDS
AND PUSH CHIN UPWARDS

PINCH THE NOSE
COMMENCE VENTILATION
FOUR GOOD INFLATIONS
MOUTH-TO-MOUTH

IF CHEST DOES NOT RISE
RE-CHECK AIRWAY, REMOVE
OBSTRUCTION AND RE-INFLATE

CHECK PULSE

POSITION OF PULSE

PULSE PRESENT

PULSE ABSENT

HEART HAS STOPPED BEATING
LAY ON BACK ON FIRM SURFACE
(eg FLOOR).
COMMENCE EXTERNAL CHEST
COMPRESSION AND CONTINUE
MOUTH-TO-MOUTH VENTILATION

ONE FIRST AIDER
15 Compressions at 80 per minute followed by 2 Inflations

TWO FIRST AIDERS
One conducts chest compressions, without pause at 60 per minute. The other administers mouth-to-mouth ventilation – after each 5th compression.

Check heart beat after first minute and then after every three minutes. Continue external chest compression and mouth-to-mouth ventilation until a normal pulse is felt and colour improves.

CONTINUE INFLATIONS
UNTIL RECOVERY OF
NORMAL BREATHING

CONTINUE INFLATIONS
UNTIL RECOVERY OF
NORMAL BREATHING

WHEN NORMAL BREATHING COMMENCES
PLACE CASUALTY IN RECOVERY POSITION

Keep casualty at rest. Remove on a stretcher. Watch closely, particularly for difficulty in breathing. Lightly cover with blankets or other materials.

SEND FOR DOCTOR AND AMBULANCE

DOCTOR	AMBULANCE	HOSPITAL	Nearest First Aid Post
TELEPHONE	TELEPHONE	TELEPHONE	

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Two-Tone Source 9083

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HANDBOOK AMENDMENTS

Amendments to this handbook (if any), which are on coloured paper for ease of identification, will be found at the rear of the book. The action called for by the amendments should be carried out by hand as soon as possible.

'POZIDRIV' SCREWDRIVERS

Metric thread cross-head screws fitted to Racal equipment are of the 'Pozidriv' type. Phillips type and 'Pozidriv' type screwdrivers are not interchangeable, and the use of the wrong screwdriver will cause damage. POZIDRIV is a registered trade mark of G.K.N. Screws and Fasteners Limited. The 'Pozidriv' screwdrivers are manufactured by Stanley Tools Limited.

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SECTION 1

TECHNICAL SPECIFICATION

TECHNICAL SPECIFICATION

TONE A

Frequency:	10Hz to 10kHz.
Frequency Ranges:	10Hz to 100Hz, 100Hz to 1kHz and 1kHz to 10kHz.
Frequency Setting:	By rotary control operating in conjunction with a range switch and fine tune potentiometer.
Frequency Accuracy:	±5% of dial setting ±3Hz.
Fine Tune Adjustment:	From 1% to 10% of dial setting according to frequency.
Frequency Stability:	Better than ±0.01% over any 5 minute period at constant temperature after 30 minute stabilising period (when changing tones a further 5 minutes stabilisation is required).
Temperature Coefficient:	Better than 0.04% per ^{o}C after 30 minute stabilising period.
Level:	Continuously variable over at least 12dB.

TONE B

Frequency:	100Hz to 100kHz
Frequency Ranges:	100Hz to 1kHz, 1kHz to 10kHz and 10kHz to 100kHz.
Frequency Setting:	By rotary control operating in conjunction with a range switch.
Frequency Accuracy:	±5% of setting ±3Hz.
Frequency Stability:	Better than ±0.01% over any 5 minute period at constant temperature after 30 minute stabilising period. (when changing tones a further 5 minutes stabilisation is required).

TONE B (Cont'd)

Temperature Coefficient:	Better than 0.04% per °C after 30 minute stabilising period.
Level:	Continuously variable over at least 12dB.

OUTPUT CHARACTERISTICS

Output Functions:	Tone A, Tone B or Tone (A + B) are selected on a five position switch. Two further switch positions provide x2 facilities for Tone A or Tone B.
Output Level:	Either tone can be varied between 0 and 5V r.m.s. e.m.f. by means of an output level range switch operating in conjunction with a stepped attenuator. In addition both tones can be summed as (A + B). The maximum level of the composite tone is 10V r.m.s. e.m.f.
Output Level Ranges:	Nine ranges with f.s.d's of 0.5, 1.5, 5, 15, 50, 150, 500mV, 1.5 and 5 Volts (-70dB to +10dB in 10dB steps) selected by a ten position switch that includes an off position.
Accuracy:	±0.2dB/step but not exceeding a total of ±1dB.
Output Level Attenuator:	0-10dB attenuation adjustable in 1dB steps.
Attenuator Accuracy:	±0.02dB/1dB step but not exceeding a total of ±0.1dB.
Output Level Flatness:	±0.4dB.
Metering:	The amplitude of either tone can be monitored on a front panel meter. Accuracy of indication ±0.5dB.

UNBALANCED OUTPUT

Frequency Range:	10Hz to 100kHz.
Output Connection:	A single-ended output from a BNC connector on the front panel.

UNBALANCED OUTPUT (Cont'd)

Impedance:	600 ohms ±2%.
Total Harmonic Distortion: (at maximum output)	Less than 0.1% from 100Hz to 10kHz. Less than 0.3% from 10Hz to 100Hz and from 10kHz to 100kHz.
Intermodulation and other Spurious signals:	More than 75dB below wanted signal.
Hum and Noise:	Less than 0.05% of output +5μV.

BALANCED OUTPUT

Frequency Range:	100Hz to 10kHz (usable from 10Hz to 100kHz).
Output Connection:	A floating, centre-tapped output from terminals on the front panel.
Impedance:	600 ohms ±2% with centre tap.
Total Harmonic Distortion: (at maximum output)	Less than 0.1%.
Intermodulation:	More than 65dB below wanted signal.
Hum and Noise:	Less than 0.05% of full output.

MONITOR OUTPUT

Output Connection:	A buffered single-ended output from a front panel BNC connector.
Impedance:	1k ohm ± 10%.
Level:	100mV r.m.s. nominal e.m.f.

POWER REQUIREMENTS

Supply:	90 to 130V r.m.s. 180 to 260V r.m.s. 45 to 440Hz.
Consumption:	6VA approx.

MECHANICAL

Dimensions: (Overall):	Height:	159 mm (6.2 in)
	Width:	402 mm (15.9 in)
	Depth:	313 mm (12.3 in)
Weight:	5 kg	(11 lb)

ENVIRONMENTAL CONDITIONS

Operating Temperature Range:	0°C to +40°C
Storage Temperature Range:	-40°C to +70°C.
Humidity:	95% r.h. at +40°C.
Environmental Specification:	Tested in accordance with IEC68 (BS2011) recommendations.
Safety Standard:	Designed to meet IEC348 (BS4743) recommendations.

ACCESSORIES

Accessories Supplied:	Operators Manual, 115V Fuse.
Accessories not Supplied:	Terminal-to-BNC Adaptor Part No. 23-3191.

SECTION 2

DESCRIPTION

OPERATION & MAINTENANCE

CHAPTER 1

GENERAL DESCRIPTION

INTRODUCTION

1.1 Model 9083 is a portable, mains-powered signal source, providing two tones, independently adjustable in both output-level and frequency. The output of either generator may be selected for use as a normal single-tone source, or the two signals may be directly added for use in the measurement of intermodulation products introduced in the linear elements of transmission system equipment.

1.2 The instrument contains two independent R-C Oscillators of the "Wien Bridge" type, one covering the frequency range of 10Hz to 10kHz and the other 100Hz to 100kHz. The two generators are fed from a common mains power-supply unit and their outputs are selected and combined, when desired, in a common output unit, containing function-selection, level monitoring and selection, and termination configuration selection.

SPECIAL FACILITIES

1.3 Each oscillator is continuously variable over its tuning range by means of a three-decade RANGE SWITCH and a calibrated FREQUENCY dial. Tone A generator is also equipped with a FINE frequency adjustment control for greater precision.

Both oscillators possess LEVEL setting potentiometers. The two generators are disposed on either side of a central panel area which contains the remaining controls which consist of:-

(a) The level monitoring meter, calibrated in terms of output emf (in volts), on a black scale arc, and in dB relative to 1mW in 600 ohms, on a red scale.

(b) The TONE SELECT function switch, which permits the output of either oscillator to be presented to the front panel terminals, or for the outputs to be combined.

(c) The output level controls, consisting of a switched OUTPUT RANGE control of eight 10dB steps (equivalent to 5V to 0.5mV), and an OFF position, and the OUTPUT LEVEL dB control of ten 1dB steps.

(d) The OUTPUT selection switch, which routes the signal to a coaxial socket providing a 600 ohm unbalanced output, or via a transformer to three terminals giving 600 ohms balanced source impedance, with a centre tap. A separate earth terminal is provided.

(e) A MONITOR output socket, which provides a signal of nominally 100mV e.m.f. amplitude from a source impedance of 1000 ohms, for connection to a frequency counter or oscilloscope etc.

(f) The mains power switch and indicating lamp.

POWER SUPPLY

1.4 The instrument operates from a.c. mains power supplies from 90 to 130V r.m.s. and 180 to 260V r.m.s., as selected by a rear-panel mounted slide-switch, for input frequencies from 45 to 440Hz. The mains voltage slide-switch is covered by a transparent safety plate.

MAINTENANCE

This manual contains sufficient information to permit normal routine calibration and fault clearance, but the user is recommended to take advantage of the servicing and information facilities offered by Racal-Dana Instruments and their Agents. The instrument is delivered in a specially designed primary pack, which should be retained for use if it is necessary to return the unit to the manufacturer, or to their Agent.

CHAPTER 2

PREPARATION FOR USE

The instrument should be inspected upon receipt for any signs of damage which may have occurred in transit. To obtain access to the interior of the case proceed as follows:-

REMOVAL OF COVERS

WARNING: DANGEROUS AC VOLTAGES ARE EXPOSED WHEN THE COVERS ARE REMOVED WITH THE INSTRUMENT CONNECTED TO AN AC SUPPLY.

2.1 (1) Set the POWER switch to the off position, and disconnect the instrument from the mains supply point.

(2) Remove the rubber plugs (located near to the rear panel) from both sides of the instrument and slacken, by about two turns, the screws so revealed. Remove the six screws at the edges of the top and bottom covers.

(3) Grip the rear panel assembly and ease it back from the main case to the maximum extent available (about 5 mm).

(4) The rear edge of either cover can now be lifted, and the cover withdrawn outwards and rearwards.

To replace the covers, reverse the above procedure.

TRANSFORMER VOLTAGE SELECTION

2.2 The instrument will normally be dispatched with the mains-transformer primary set to the 180 to 260 volt range, but before attempting to put the instrument into service the setting should be checked by reference to the selector switch, mounted on the rear panel. Any necessary adjustment may be made by removal of the transparent cover, which must then be replaced.

Power Fuse

2.3 Check that the power fuse, mounted on the rear panel, is correctly rated for the supply voltage. The fuse is a glass cartridge type, 5 x 20 mm, of the anti-surge type.

Supply Voltage Range	Fuse Rating	R-D Part Number
90 to 130 volts	250mA	23-0031
180 to 260 volts	125mA	23-0043

Power Lead

2.4 The mains power connector lead should be fitted with a suitable plug, (fused types being fitted with an appropriately rated fuse), according to the standard colour code:-

BROWN	LINE	Ref. BS 4410
BLUE	NEUTRAL	Plug to BS 1363
GREEN/YELLOW	EARTH (GROUND)	

OUTPUT CONNECTIONS

2.5 When using the 600 ohm Balanced Output facility, connections may be made using 4 mm plugs, or 'spade' terminals, mounted on appropriately screened leads.

Coaxial leads, furnished with 500 ohm BNC type connectors, are used when taking the output from the 600 ohm Unbalanced socket, and when using the Monitor Output signal.

CHAPTER 3

DESCRIPTION OF CONTROLS

POWER ON/OFF SWITCH

This switch connects the instrument to the a.c. supply mains, the associated pilot lamp showing whether the generator is operating, or not.

TONE SELECT

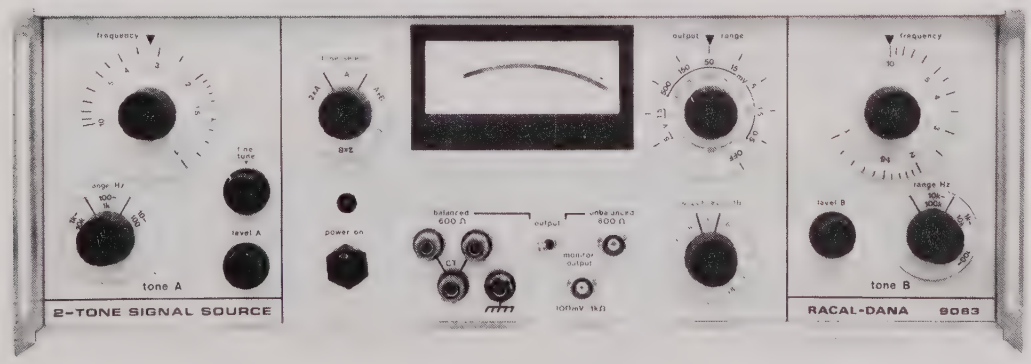
This five-position rotary function switch provides the following facilities:-

A, or B, which routes the output of either oscillator to the output connectors.

2 x A, or 2 x B, which again selects the output of either oscillator, at an increased amplitude of 10 volts, r.m.s.

A + B, where the two independent signals are added in the output circuitry.

This switched attenuator, of eight 10dB steps, when allied to a full-scale setting on the meter, permits a maximum output voltage level from 5 volts to 0.5 millivolts e.m.f. to be obtained. A final position, labelled OFF, disconnects the output signal, but preserves the output impedance at the output connectors.



Front Panel 9083 Fig.3.1

OUTPUT LEVEL dB	A further variation of output level is effected by this eleven position switch, giving an additional ten decibels in 1dB steps.
OUTPUT	A two-position toggle switch routes the output signal either directly to the unbalanced 600 ohm coaxial socket, or alternatively via the internal unbalanced-to-balanced transformer, and thence to the output screw-terminals.
MONITOR OUTPUT	A further 50 ohm BNC socket provides an output of nominally 100mV e.m.f. amplitude from a source impedance of 1000 ohms, which may be connected to other ancillary apparatus, such as an oscilloscope, counter etc.
FREQUENCY	Each oscillator section is equipped with a calibrated dial, covering a range of 1 to 10.
RANGE	The frequency range switches, when used in conjunction with the Frequency dials, permit the user to set the operating frequency of the respective oscillators. Each of these three-position switches covers three decade ranges, oscillator A from 10Hz to 10kHz, and oscillator B from 100Hz to 100kHz.
FINE	For greater precision in frequency setting, Oscillator A is also provided with a fine frequency control, with a coverage of at least 1% of the main Frequency Dial setting.
LEVEL	Each oscillator section of the front panel carries a variable potentiometer to permit the accurate setting of the respective signal output level, with a range of at least 12dB.
METER	The meter carries two voltage scales, calibrated, (in black) from 0 to 5 and 0 to 1.5, which corresponds to the indications of the Output e.m.f. switch. A further scale is provided, calibrated (in red) in decibels from 0 to -12dB, relative to 1mW in 600 ohms.

REAR PANEL ITEMS

Mains Input Socket	The instrument is fitted with a three-pin mains power input socket, designed to comply with the requirements of IEC Specification 320 and CEE 22. This component is a combined socket/filter and is used to reduce the effects of mains-borne interference.
Power Fuse	A glass cartridge fuse is fitted, in a protected holder, meeting the requirements of IEC Specification 320 and CEE 22. Ratings are as specified on page 2-1.
Transformer Voltage Selection Switch	A recessed slide-switch is provided to permit selection of the 90 to 130, or 180 to 260 volt range. A protective transparent cover is fitted to prevent accidental operation.

CHAPTER 4

OPERATING INSTRUCTIONS

POWER SUPPLY

4.1 Before putting a new instrument into operation, or when moving to a new location, check that the a.c. mains supply voltage is suitable. Check that the mains transformer voltage range selector is correctly set. (See the rear panel).

SINGLE-TONE SIGNAL SOURCE

4.2 To operate Model 9083 as a conventional, single-tone signal source, set the TONE SELECT switch to 'A' or 'B', depending upon the output frequency required, remembering that A must be used between 10 and 100Hz, and B between 10 and 100kHz, the range between 100Hz and 10kHz being common to both sections.

If an output level of between 5 and 10 volts e.m.f. is required, it will be necessary to select '2xA' or '2xB', as appropriate.

4.3 Having set the TONE SELECT function switch, set the FREQUENCY RANGE switch and the FREQUENCY dial to the required value. The actual frequency may be verified by connecting a digital counter to the MONITOR OUTPUT socket. If oscillator A is in use, small variations of frequency may be made by adjustment of the FINE frequency control. Excellent frequency stability is a feature of the Model 9083, as defined in the appropriate sections of the Technical Specification.

4.4 The signal level may be set, by adjustment of the LEVEL control of the appropriate oscillator section, the actual e.m.f. presented to the circuit under test being deduced from the meter reading multiplied by the range factor indicated by the OUTPUT RANGE dial, plus the effects of the setting of the OUTPUT LEVEL dB Attenuator. When the TONE SELECT function switch is set to either of the positions '2xA' or '2xB', the actual e.m.f. will be twice the value indicated.

TWO-TONE SIGNAL SOURCE

4.5 When used as a generator of two independent tones, for example during the testing of single-sideband equipment, the two frequencies are set as indicated above. The relative levels are first set by switching the TONE SELECT control to A or B, as required, remembering that in the combined signal position the meter is inoperative,(since the instantaneous value of the actual total signal will be dependent upon the frequencies and phases of the two constituent signals, which may result in a totally meaningless indication on the mean reading voltmeter).

4.6 Having set the levels of the two individual signals, as required, variations of the total signal may be made, using the output attenuators, relative to the initial setting.

OUTPUT CONFIGURATION

4.7 The desired e.m.f. set as indicated above, is derived from a source impedance of 600 ohms, and may be either balanced (from the floating, centre-tapped output transformer), or unbalanced. The Unbalanced signal is presented via a 50 ohm type BNC coaxial socket, and the Balanced output via three screw terminals (with 4 mm sockets).

Suitable screened leads should be used to prevent cross-coupling of unwanted signals.

CHAPTER 5

CIRCUIT DESCRIPTION

INTRODUCTION

5.1 With exception of the Attenuator Units, Front Panel Controls and certain components associated with the power supply, all circuitry is mounted on one p.c.b. assembly. Access, for re-calibration adjustment and/or fault clearance, may be gained as described in Chapter 2, para.2.1.

Throughout the design and construction of the instrument, high grade materials and components have been used, resulting in excellent performance and stability, and particular attention has been given to minimising the effects of extraneous radio frequency interference.

CIRCUIT SYMBOLS

5.2 The Oscillator and Buffer Amplifier sections of the circuit are based upon the use of integrated circuit elements, which are identified in the circuit diagrams and other parts of this publication by the appropriate component number. In the circuit description, a particular IC pin will be identified by a reference such as 'IC3/6', which indicates pin 6 on that particular element.

Other symbols used are those normally encountered in conventional practice.

CIRCUIT SUMMARY

5.3 The basic operation system of the instrument may be readily understood by reference to the Interconnection Diagram, Figure 1.

Signals from the two oscillator units 'A' and 'B', are routed via the Tone Select switch, S2, and thence to the Output Summing Amplifier and also to the Metering Circuit. The former, across which is connected the Output Level dB attenuator, S6, (giving 10dB of signal attenuation in 1dB steps), feeds the Output Range attenuator, S5, (which enables the user to select a further variation of output level of from +10 to -70dB in 10dB steps, together with a signal 'OFF' position). The Output Switch, S4, then passes a signal of the desired amplitude either to the 600 ohm Unbalanced output socket SKT2, or through the unbalanced to balanced transformer, T2, and so to the three terminals.

The Metering Circuit rectifies the selected signal, (other than when the 'A + B' function is operative) to drive the 1mA Meter, M1.

5.4 The output from the Power Supply section is routed to the other circuit units; in the case of the two oscillators the appropriate voltages are switched by the Tone Select switch, S2, as covered in more detail in a later Section.

OSCILLATOR AND BUFFER AMPLIFIER

5.5 The two, largely similar, oscillator sections are based upon the Wein Bridge configuration, and employ integrated circuits (IC3 and IC9) as the sustaining amplifiers. There are two feed-back paths connected to these fast slew-rate amplifiers, one consisting of the RF frequency determining elements; the other being the level-stabilising negative feed-back path incorporating the thermistor, TH1 (and TH2). (See Figure 2).

5.6 The oscillator output frequency is determined by the selection of two fixed capacitor assemblies, by means of the Frequency Range switch, (S1 or S7), plus the setting of the Frequency variable ganged potentiometer, (RV1 or RV5 etc), and, in the case of oscillator A only, the Fine Frequency potentiometer, RV2.

5.7 The Fine Frequency potentiometer has been chosen to provide a total possible variation of at least 1% of any main dial setting, thus enabling the user to set the actual frequency to within 0.1%. It is, of course, necessary to use a digital frequency counter connected to the Monitor Output socket to verify the exact value.

5.8 The design has been centred upon fixed capacitor assemblies whose magnitudes are decade multiples of eleven 'units', (e.g. 1.1μF), which are readily achieved by the use of 10% tolerance components, with suitable additional parallel padding. This philosophy permits the use of modern, high-stability components of normal preferred value and tolerance, rather than employing high-precision, special-value items.

Example: The 1.1μF assembly referred to above, may consist of a nominal 1.0μF capacitor at its +10% high limit, or of any other value down to 0.9μF, with a suitable padding capacitor, chosen to bring the total to within 1% of the desired value.

5.9 The proportion of the total available resistance variation which is used to secure a 10:1 frequency change is such that a further 5% (minimum) overlap is present on each range. This obviates the necessity of both end-to-end Frequency dial, and Range switch changes, when small frequency variations are required about either extremity of the dial coverage.

5.10 Pre-set variable resistors are included to permit matching of the frequency coverage to the pre-calibrated dial assemblies. (For procedure, see the Maintenance Section, Chapter 6).

5.11 When Model 9083 is operated as conventional single-tone source, special provision is made to ensure that the output frequency is as free as possible from unwanted signal content. This is achieved by the connections of the Tone Select switch, which routes the supply voltages only to the particular oscillator in use. When changing from one oscillator to the other, it is necessary to allow a further short stabilisation period,

(5 minutes), to allow the components in the oscillatory circuit to reach thermal equilibrium, if it is required to exploit to the full the instruments excellent capability for this design performance parameter.

5.12 Two output signals are taken from the sustaining amplifier integrated circuits, one being taken to the inverting input of the buffer-amplifier integrated circuits, (IC4/2 or IC10/2), the other going via the complimentary pair of transistors, Q1 or Q10 and Q11 or Q12. These two emitter followers are arranged to provide the necessary buffered output, with minimum d.c. content, to feed the Monitor Output socket with a signal suitable for use with ancillary instruments, such as a digital frequency counter.

5.13 The non-inverting input of the buffer-amplifier integrated circuits, (IC4/3 and IC10/3), are tied to the zero volt supply rail via 1 Kohm resistors, chosen to match the conditions seen by the inverting inputs, so minimising drift. Stabilising negative feedback, chiefly operative at higher frequencies, is applied through the 47pF capacitors, C17 or C55.

5.14 The output of the buffer-amplifiers is taken from the potentiometer chain formed by the resistors R18 (R72), RV11 (RV23) and R20 (R74), to provide the required signal levels to produce the final 5 and 10 volt maximum.

5.15 Special provision is made for the 15 volt supplies required by the integrated circuits, which are derived from the main positive and negative 20 volt rails, by the interposition of the two integrated monolithic voltage regulators, IC1 (IC7) and IC2, (IC8) with their associated components. In addition to reducing the main 20 volt supply to the 15 volts required by the integrated circuits, this system ensures minimum hum content in the output signal.

5.16 Further protection to the circuit is provided by 500mA fuses, (F2 and F3), mounted on the printed circuit board.

OUTPUT SUMMING AMPLIFIER

5.17 The signals produced by the two Oscillator/Buffer Amplifier sections are selected by the Tone Select function switch and passed to the Output Summing Amplifier, where they are applied to a resistive input network connected to the base of one element of a dual transistor, (Q5a and Q5b). These transistors, connected as an emitter-coupled pair, (with a 'long tail' provided by the 6k8 resistor, R47), result in true current summation of the two input waveforms. (See Figure 3).

5.18 Outputs from the collectors of the input pair are taken to the bases of a further pair of emitter-coupled transistors, (Q6 and Q7), whose collector circuits contain transistors Q8 and Q9 connected as a 'current mirror'; the collector and base of Q8 being connected together and the base of Q9 also being driven from the collector of Q8.

5.19 The whole amplifier is d.c. coupled throughout, thus eliminating the large coupling capacitors which would be necessary for a frequency response extending well below the lower signal frequency of 10Hz, and which would be subject to the pick-up of hum and other extraneous and unwanted signals. The pre-set variable potentiometer, RV13, is included in the collector circuit of the input pair, to facilitate adjustment for minimum d.c. off-set at the amplifier output.

5.20 This final output signal is produced at the link between the series-connected collectors of transistors Q7 and Q9, where three paths diverge:-

(a) the main output, which is connected to the Output Range Attenuator,

(b) the output to the Metering Circuit,

and (c) the Monitor Output, when the Tone Select switch is set to A + B.

An overall negative feed-back path is formed by the Output Level dB Attenuator, as described in para.5.2.6.

METERING CIRCUIT

5.21 The input to the Metering Circuit (As shown in Figure 4) is selected by section S2f of the Tone Select function switch, with the additional series resistance formed by RV16 and R42 being included when the high output positions, 2 x A and 2 x B, are operative. This input signal, attenuated by R22 and R23 to 2 volts maximum, is applied via the capacitor C25 to the base of Q2, which is one of a pair of emitter-coupled transistors, the base of the other transistor, Q3, being connected to the full-wave bridge rectifier formed by diodes D3 to D6, inclusive.

5.22 The output from the collector of Q2 drives the other input to the bridge rectifier, suitably adjusted in level by transistor Q4 and its collector load, R33 and R32. The resultant d.c. component of the rectified current is stored in the 1000µF capacitor, C23, and applied to the 1mA meter, connection being made by separate twisted leads, neither connection being at earth potential.

5.23 The diode D7 ensures that, upon 'switch-on', the capacitor C24 is rapidly charged, thus preventing the meter from deflecting beyond its overload limit.

5.24 Considerable attention has been given to ensuring that susceptibility to 'RFI' is minimised, the network consisting of R24 and C58, together with the capacitor C27 being specially included to prevent erroneous readings occurring when the Two Tone Generator is operated in the vicinity of a transmitter.

ATTENUATORS (Fig. 5)

5.25 The instrument is equipped with two switched attenuator assemblies, namely the Output Level dB switch, SW1, of eleven positions giving ten steps of 1dB, ranging from zero to -10dB, and the Output Range control, SW2, which incorporates a signal 'Off' position and eight steps each of 10dB.

The Output Level dB Attenuator

5.26 Reference to Figure 5 will show that the Output Level dB Attenuator consists of a chain of resistors with the switch wiper arranged to tap off a given proportion of the total available resistance value. The included value forms the negative feed-back path of the Output Summing Amplifier, the maximum value being inserted for the zero dB, or full output position, with each subsequent step removing sufficient resistance to reduce the output by a 1dB decrement.

5.27 The principal resistive elements consist of high-grade metal film components, of the standard preferred values within the 1% tolerance sequence, padded in parallel by 5% tolerance carbon film resistors. This procedure results in an attenuator assembly of high precision and stability, containing readily available components of minimum cost.

Output Range Attenuator

5.28 The main, or common, stepped attenuator, SW2, is a conventional ladder resistive network of a basic pi form, with additional series elements at the output tapping points to preserve the output impedance. The actual output impedance of the attenuator is 509 ohms, which allows for compensation to be inserted for the inherent resistive portion of the additional impedance introduced by the inevitable losses in the Unbalanced-to-Balanced transformer.

5.29 Eight steps, each of ten Decibels, are provided, plus a further signal 'Off' position, where the Output Socket is disconnected from the signal source, but grounded via a resistor, so maintaining the impedance as 'seen' by any equipment to which the generator is connected.

5.30 Again, as with the Output Level dB Attenuator, the design is optimised around the use of parallel combinations of 1% preferred value metal film resistors and 5% carbon resistors.

THE OUTPUT CIRCUIT

5.31 The signal delivered by the Output Range Attenuator may be directed by the Output switch, S4, to the BNC coaxial socket, as an unbalanced output, or alternatively, to the three output terminals as a balanced output derived from the unbalanced to balanced transformer. (See Figure 1).

5.32 As mentioned above, the transformer does introduce some small losses, due to such factors as copper loss in the windings, hysteresis and eddy-current losses in the core etc, which appear as an in-phase component of the total complex impedance, and which are effectively in series with the source impedance. The design of the Output Range Attenuator results in a basic source impedance of 509 ohms, to which is added a compensating series resistor to achieve the total figure of 600 ohms, ± 2%. In the case of the unbalanced output, a single 91 ohm resistor, R54, is inserted between the Output switch and the BNC connector. In the alternative balanced output condition, a 50 ohm pre-set potentiometer RV17 is included, so enabling individual adjustment to be made for variations in the transformer losses, which are usually about 60 ohms.

THE MAIN POWER SUPPLY

5.33 The main Power Supply circuit diagram is depicted in Figure 6, while the necessary routing of power to the two Oscillator/Buffer Amplifier sections is shown on the overall Interconnection Diagram, Figure 1.

5.34 The a.c. mains voltage is fed into the instrument through a combined input socket and integral filter unit, mounted on the rear panel. A glass cartridge fuse is inserted in the 'line' connection, also accessible from the rear panel; the mains supply then passing via the front panel mounted double-pole Power On/Off switch, S3, to the Voltage Range Selector switch, S8. Two ranges of mains voltage may be selected, viz

90 to 130 volts a.c. r.m.s.,
or 180 to 260 volts a.c. r.m.s.

for a frequency range of 45 to 440Hz, the stabilizing circuitry being designed to cope with variations within these limits without further adjustment. S8 is also mounted on the rear panel.

5.35 The mains power socket/filter unit, the mains fuse-holder and the Voltage Range Selector switch are designed to comply with the requirements of IEC Specification 348.

5.36 AC mains power is then applied to the appropriate terminals of the torroidaly wound transformer, which is mounted on the instrument rear panel, and which has been chosen to ensure a low external 'hum' field. The output of the secondary winding of the mains transformer is applied via two slow-blow glass cartridge fuses, to a pair of encapsulated bridge-connected rectifier units to produce the required positive and negative supply rails. Reservoir capacitors, formed by pairs of 680μF, 40V components are followed by integrated monolithic voltage regulator units, (IC5 and IC6). The associated capacitors, (C19,20 and C40,41) are included to prevent instability. The resultant highly stable d.c. voltage supply rails are connected to the remainder of the circuitry, the special requirements of the Oscillator/Buffer Amplifier sections being met by further stages of regulation, as described in para.5.18.

5.37 The Power 'On' indicator lamp, which is a front panel mounted light emitting diode unit, is fed from the +20 volt rail, in series with a current limiting resistor, R21, of 1 Kohms.

5.38 All components, other than those specifically referred to above, are mounted on the main printed circuit board, and all lengthy runs of wiring carrying a.c. mains power is effected with screened cable.

CHAPTER 6

MAINTENANCE

TABLE 1

TEST EQUIPMENT REQUIRED

Item No.	Preferred Item	Remarks
1.	Frequency Counter. Racal-Dana 9901, (with LF multiplier option).	Frequency:- 100Hz to 100kHz. Sensitivity:- 100mV.
2.	Digital Multimeter, Racal-Dana 3800.	AC and DC volts, DC current and Resistance.
3.	AC Voltmeter, Datron 1030A.	AC volts, 1mV to 10V f.s.d, ±0.5% over a frequency range of 10Hz to 100kHz.
4.	Distortion Factor Meter, Hewlett Packard 331A, or Marconi Instruments TF 2331.	Distortion Factor to 0.1% full-scale, over a frequency range of 10Hz to 100kHz. AC volts 1mV to 10 volts f.s.d.
5.	Wave Analyser, Marconi Instruments TF 2330	As for 4 above.
6.	Oscilloscope, Racal-Dana 9836.	Vertical amplifier characteristics - DC to 10MHz, 10mV per division.
7.	AC Variable Ratio Mains Transformer. 'Variac'.	0 to 260 volts.
8.	300 ohm resistors, 2 off,	± 1%

TABLE 1 (Cont'd)

Item No.	Preferred Item	Remarks
9.	Test Leads, comprising	Oscilloscope 1:1 probe and lead. 50 ohm BNC to BNC lead. Adaptors, 50 ohm BNC to 4 mm plug 19 mm pitch.
10.	30kHz Low-Pass Filter	600 ohm Resistor in parallel with a capacitor of between 0.015 and 0.022μF.

REMOVAL OF COVERS

6.1 See 'Preparation for Use', Chapter 2, para. 2.1.

TRANSFORMER VOLTAGE SELECTION

6.2 See 'Preparation for Use', Chapter 2, para. 2.2.

FUSES

6.3 (a) Power Fuse - See 'Preparation for Use', Chapter 2, para. 2.3.

(b) Check the two 500mA fuses on the main p.c.b., which are in series with the supply to the two Oscillator/Buffer Amplifier sections.

POWER LEAD

6.4 See 'Preparation for Use', Chapter 2, Para. 2.4.

PERFORMANCE TESTS AND CALIBRATION

6.5 Periodic recalibration should be carried out to ensure that performance remains within the limits detailed in the Technical Specification, and also following any repair. Initially, calibration intervals of six months are recommended, this interval being suitably varied as data is acquired relevant to the particular conditions of use and storage. Components may be readily located on the printed circuit boards by reference to Figures 7, 8, and 9 at the back of the manual.

6.6 THE TEST FIGURES SPECIFIED IN THIS CHAPTER ARE TRUE VALUES. THE DEGREE OF ACCURACY AND INFLUENCE OF THE MEASURING INSTRUMENTS USED MUST THEREFORE BE TAKEN INTO ACCOUNT WHEN VERIFYING THE PERFORMANCE OF THE UNIT UNDER TEST.

6.7 Calibration commences with the assumption that all components and wiring have been correctly fitted. The Frequency dials etc are mounted with equal mechanical overlap at each end of their travel, and components of nominally correct value are fitted into the sockets for 'Factory Selected Values', but not soldered.

Power Supply Check

6.8 Following any protracted period of use, or upon completion of repair, carefully inspect for visible defects, such as omitted, damaged or badly fitted components or wiring. If satisfactory, proceed as follows.

(i) Check that the Mains Transformer range switch is correctly set and that the Mains fuse is of the correct rating, normally 180/260V, 125mA. Connect the 9083 power input to the Variac output.

(ii) Set the Variac to 30 volts, and with the 9083 switched OFF, check that no a.c. voltages are present between printed circuit board (p.c.b.) pins 36 and 37, and between pins 41 and 42.

(iii) Switch the 9083 ON and check the polarity and voltage across the capacitors C9, C10 and C37, C38. The former pair must be positive, and of the order of +2.4 volts, the latter being negative and of the order of -2.4 volts.

(iv) Check the polarity and voltage on each of the stabilised supply rails, as follows:-

Sequence	Location	Test Points	Tone Select set to:-	Polarity and Voltage (nominal value)
1	+20V rail	E to C or N	A + B	+0.5V
2	-20V rail	H to C or N	A + B	-0.5V
3	+15V rail	A to C or N	A	+0.5V
4	-15V rail	B to C or N	A	-0.4V
5	+15V rail	J to C or N	B	+0.5V
6	-15V rail	K to C or N	B	-0.4V

(v) Switch the 9083 OFF, and increase the Variac setting to 240V. Check that the Mains ON/OFF LED indicator is NOT illuminated. Repeat the polarity and voltage checks in (iv), above, with the 9083 switched ON, noting that the LED is now illuminated.

Sequence	Location	Test Points	Tone Select set to:-	Polarity and Voltage
1	+20V rail	E to C or N	A + B	+19.4 to +20.6 volts
2	-20V rail	H to C or N	A + B	-19.4 to -20.6 volts
3	+15V rail	A to C or N	A	+13.8 to +16.2 volts
4	-15V rail	B to C or N	A	-13.8 to -16.2 volts
5	+15V rail	J to C or N	B	+13.8 to +16.2 volts
6	-15V rail	K to C or N	B	-13.8 to -16.2 volts

(vi) Measure the +20 volt rail potential with the Variac set first to 180 volts and then to 260 volts. The stabilised voltage must again lie within the limits of +19.4 and +20.6 volts. The a.c. ripple on the line, as measured with the oscilloscope must not exceed 10mV p-p.

(vii) Switch the 9083 OFF, disconnect the Variac from the a.c. mains, and re-set the Mains Voltage Selector to the 90 to 130 volt range, remembering to replace the transparent cover plate. Replace the Mains Fuse with one rated at 250mA. Again, measure the potential of the +20 volt rail, which must be within the limits of +19.4 and +20.6 volts, when the 9083 is reconnected to the Variac with the latter set to any supply voltage between 90 and 130 volts.

(viii) Switch the 9083 OFF, disconnect the Variac and restore the original setting of the Mains Voltage selector (replacing the cover-plate) and Fuse rating. Reset the Variac to 240 volts, reconnect to the 9083 and switch ON.

The preceding sequence of tests ensure that the 9083 stabilised power supplies are operating to specification. This procedure is a prerequisite to calibrating the other controls and functions, and, by implication, ensures that there are no serious malfunctions in other circuit areas which would impose exceptional current drain.

Preliminary Operational Tests

6.9 (i) With the 9083 switched ON, use the oscilloscope to check the general operational functioning of the instrument, with the variable controls adjusted from one extremity to the other.

(ii) Measure the d.c. off-set at Test Point D, and adjust RV8, if necessary, for reading of less than 1 millivolt, (TONE SELECT set to A).

(iii) The d.c. off-set at Test Point Q should then be less than 100mV.

(iv) Measure the d.c. off-set at Test Point S, and adjust RV10, if necessary, for a reading of less than 1mV.

(v) Check the amplitude of the signal at the Monitor Output Socket, which must exceed 141mV, peak-to-peak, (50mV r.m.s.), measured across a 1kΩ load.

(vi) Similar measurements are then made for Oscillator B, i.e. set the TONE SELECT switch to B.

Adjust RV20, if necessary, for less than 1mV d.c. off-set at Test Point L.

Check for less than 100mV d.c. off-set at Test Point R.

Adjust RV22, if necessary, for less than 1mV d.c. off-set at Test Point T.

Again check the amplitude of the Monitor Output, for greater than 141mV p-p, or 50mV r.m.s. across a 1kΩ load.

(vii) With the oscilloscope, check all settings of the TONE SELECT function switch. Positions A, 2A, B and 2B result in pure sinusoidal outputs, whereas the A + B setting produces a complex display from the true summation of the two individual waveforms.

Output Level and Attenuator Calibration

6.10 Set the 9083 front panel controls as follows:-

TONE SELECT to 2 x A, Frequency RANGE A to 1kHz to 10kHz, FREQUENCY dial A to 1, FINE TUNE to the Calibrated (mid) position, LEVEL A fully clockwise, OUTPUT switch to Unbalanced, OUTPUT RANGE Attenuator switch to +10dB and the OUTPUT LEVEL dB switch to 0dB.

(i) Using the a.c. voltmeter connected to output socket SK2, adjust RV14 for 12 volts r.m.s. output from the 9083. Set TONE SELECT to A and adjust RV11 to give 6V r.m.s. output.

Reset the 9083 controls as follows:-

TONE SELECT to 2 x B, RANGE B to 1kHz to 10kHz, FREQUENCY dial B to 1 and LEVEL B fully clockwise.

(ii) Adjust RV15 for 12 volts output.

(iii) With the TONE SELECT at B, adjust RV23, for 6 volts output.

Meter Calibration

6.11 (i) Set the TONE SELECT switch to A and LEVEL A for 5 volts indicated on the a.c. voltmeter. Adjust RV12 for 5 volts on the 9083 meter.

(ii) With the TONE SELECT at 2 x A, adjust RV16 for 5 volts on the 9083 meter (10 volts on the a.c. voltmeter).

Meter Scale Shape

6.12 Set the TONE SELECT switch to A. Using LEVEL A check the meter accuracy at 5, 4, 3, 2 and 1 volt meter readings on the 9083, against the a.c. voltmeter indication. The error should not exceed ±0.2dB at each setting. Note. It will be necessary to adjust the OUTPUT LEVEL dB switch at the 1 volt level.

Meter Circuit Frequency Characteristic

6.13 Check the meter indication against the a.c. voltmeter at a level of 5 volts at frequencies of 10 and 100Hz, (TONE SELECT to A), and at 10 and 100kHz, (TONE SELECT to B). With reference to the indication at 1kHz the error must not exceed ±0.3dB.

Output Range Attenuator

6.14 Set the controls for an output level of exactly 5V at 1kHz as measured at the 9083 output with the a.c. voltmeter. Check each step of the Output Range Attenuator against the a.c. voltmeter indication, as follows:-

(i) Switch to the next attenuator setting shown in Table 2. Ensure that the a.c. voltmeter reading is within the limits shown in the table for that setting.

(ii) Reset the output level, as measured on the a.c. voltmeter, to the figure shown in the table. Repeat step (i).

TABLE 2

Attenuator Setting (dB)	Voltmeter Reading Limits	Reset Output Level to
+10		5.00V
0	1.618V to 1.545V	1.500V
-10	485.4mV to 463.5mV	500.00mV
-20	161.8mV to 154.5mV	150.00mV
-30	48.5mV to 46.3mV	50.00mV
-40	16.2mV to 15.5mV	15.00mV
-50	4.9mV to 4.6mV	5.00mV

(cont'd)

TABLE 1 (cont'd)

Attenuator Setting (dB)	Voltmeter Reading Limits	Reset Output Level to
-60	1.62mV to 1.55mV	1.500mV
-70	0.49mV to 0.46mV	
OFF	Less than 50μV	

6.14a Check that the cumulative error does not exceed the specified figure as follows:-

(i) Set the controls for an output level of exactly 5V at 1kHz as measured at the 9083 output with the a.c. voltmeter.

(ii) Switch to each attenuator setting in turn, and check that the voltmeter reading is within the limits shown in Table 3.

TABLE 3

Attenuator Setting (dB)	Voltmeter Reading Limits
+10	5.00V (reference)
0	1.618V to 1.545V
-10	524.5mV to 477.5mV
-20	170mV to 147.6mV
-30	54.8mV to 45.6mV
-40	17.74mV to 14.09mV
-50	5.61mV to 4.46mV
-60	1.77mV to 1.41
-70	0.561mV to 0.446mV

Output Level Attenuator

6.15 Set the OUTPUT RANGE attenuator to OdB. Set the LEVEL A control for an output of 1.550V at 1kHz, as measured at the 9083 output with the a.c. voltmeter. This should give a level of 0dB on the 9083 meter. Check each step of the OUTPUT LEVEL attenuator against the a.c. voltmeter indication, as follows:

(i) Switch to the next attenuator setting shown in Table 4. Ensure that the a.c. voltmeter reading is within the limits shown in the table for that setting.

(ii) Reset the output level, as measured on the a.c. voltmeter, to the figure shown in the table. Repeat step (i).

TABLE 4

Attenuator Setting (dB)	Voltmeter Reading Limits	Reset Output Level to
0		1.550V
-1	1.385V to 1.378V	1.38V
-2	1.234V to 1.228V	1.23V
-3	1.099V to 1.094V	1.097V
-4	980mV to 975mV	978mV
-5	874mV to 870mV	872mV
-6	779mV to 775mV	777mV
-7	694mV to 691mV	692mV
-8	618mV to 615mV	617mV
-9	551mV to 549mV	550mV
-10	491mV to 489mV	

6.15a Check that the cumulative error does not exceed the specified figure as follows:

(i) Set the controls for an output level of 1.550V at 1kHz, as measured at the 9083 output with the a.c. voltmeter.

(ii) Switch to each attenuator setting in turn , and check that the voltmeter reading is within the limits shown in Table 5.

TABLE 5

Attenuator Setting (dB)	Voltmeter Reading Limits
0	1.550V (reference)
-1	1.385V to 1.378V
-2	1.237V to 1.226V
-3	1.105V to 1.09V
-4	987mV to 969mV
-5	882mV to 862mV
-6	786mV to 768mV
-7	700mV to 684mV
-8	624mV to 610mV
-9	556mV to 544mV
-10	496mV to 485mV

Balanced Output

6.16 Set the Output controls for an e.m.f. of 5 volts, (at 1kHz) as measured at the 9083 output. Set the OUTPUT switch to BALANCED. Connect the two 300 ohm resistors in series as a terminating load across the top two Balanced Output Terminals. With suitable adaptors and screened leads monitor the potential across the load with the a.c. voltmeter.

(i) Adjust RV17 for 2.5 volts on the a.c. voltmeter.

(ii) Check that upon disconnecting the load the a.c. voltmeter (high impedance) reading rises to 5 volts.

(iii) Check the balance of the Output Transformer by measuring the voltage between each 'high' terminal and the Centre Tap (lower) terminal. The degree of imbalance should not exceed 10mV.

(iv) Replace the load and measure the Common Mode signal between the Centre Tap and the junction of the two resistors, which must be less than 60mV r.m.s.

Frequency Calibration

6.17 Set the 9083 controls as follows; TONE SELECT to A, RANGE A to 1kHz to 10kHz, FREQUENCY dial A to 1, FINE TUNE to the Calibrated (mid) position, LEVEL A for 5 volts output e.m.f. OUTPUT switch to UNBALANCED, OUTPUT LEVEL dB attenuator to 0dB.

Note the residual resistance readings recorded during manufacture and indicated on a label on the frequency determining potentiometers. This 'hop-on' value R_{s1} and R_{s2} refer to RV1a and RV1b respectively, the 'a' section being nearest to the front panel.

Select the 'FSV' resistors R3 and R4 so that R4 + RV7 (set at mid travel) + R_{s1}, and R3 + RV6 (at mid value) + R_{s2} are both equal to 1300 ohms.

(i) Set the FREQUENCY potentiometer to its maximum, (fully anti-clockwise) position, and measure the output frequency, which should be less than 950Hz. If it is not, check the capacitor assemblies. Repeat the test with the potentiometer fully clockwise, when the output frequency should be greater than 10 500 Hz.

(ii) Set the potentiometer for an output frequency of exactly 1kHz. Fit the dial and knob and secure in position.

(iii) Measure the amplitude of the signal at Test Point D and record the value.

(iv) Set the dial to 10, and adjust the two preset potentiometers, RV6 and RV7, by similar amounts, and in the same direction, to obtain an output frequency of 10kHz. R3 and R4 should be reselected if insufficient adjustment is available.

(v) Check the Frequency ranges for compliance with the Technical Specification, with regard to frequency and amplitude.

Fine Frequency Control

6.18 Set the Frequency controls for an output of 1kHz and see that the Fine Frequency control is on the Calibrated (mid-travel) position.

(i) Turn the FINE frequency control fully clockwise and note the frequency of the output signal.

(ii) Repeat for the fully anti-clockwise position. The difference must exceed 10Hz.

Oscillator B

6.19 Set the controls as follows, TONE SELECT to B, RANGE B to 1 to 10kHz, FREQUENCY dial B to 1, and LEVEL B for 5 volts output. Repeat the procedure detailed above for the calibration of Oscillator A, the relevant components being RV5a and b, presets RV18 and RV19 and the pre-selected resistors R62 and R57.

Distortion

6.20 With the output set for 10 volts e.m.f., Unbalanced, use the Distortion Factor Meter to measure the total harmonic distortion at 10 and 100Hz and at 1, 10 and 100kHz, using Oscillator A or B as appropriate.

The total harmonic content must be within the following limits:-

Oscillator A, Range 1, from 10 to 100Hz. THD less than 0.3%
Oscillator A, Range 2, from 100 to 1000Hz. THD less than 0.1%
Oscillator A, Range 3, from 1 to 10kHz. THD less than 0.1%
Oscillator B, Range 1, from 100 to 1000Hz. THD less than 0.1%
Oscillator B, Range 2, from 1 to 10kHz. TDH less than 0.1%
Oscillator B, Range 3, from 10 to 100kHz. THD less than 0.3%

Switch to Balanced output and again measure the harmonic distortion at 100Hz, 1 and 10kHz using oscillator A, which must not exceed 0.1%.

Hum and Noise

6.21 Set the 9083 controls for an output of 10 volts e.m.f. at 20kHz on Oscillator B, and connect the Low-Pass filter network across the DFM input terminals. Measure the total Hum and Noise in the output signal, noting that the filter ensures no harmonics of the 20kHz fundamental frequency are included. Repeat at lower signal levels, ensuring that the figure obtained does not exceed 0.05% + 5μV.

Repeat with the OUTPUT switch set to Balanced, when the figure must not exceed 0.05%.

Note: Ensure that the DFM function controls are in the 'Reject Fundamental' configuration, i.e. as for normal distortion measurements.

Intermodulation

6.22 Set the 9083 controls as follows:

Both frequency RANGE switches to 1 to 10kHz, TONE SELECT to A + B, FREQUENCY dial A to 1 and dial B to 1.8, LEVEL and OUTPUT controls for 0.5 volts e.m.f., Unbalanced.

Use the Wave Analyser to search for any intermodulation distortion products at the following frequencies:-

$mf_1 \pm nf_2$, where f_1 and f_2 are the two tones and m and n are integers.

Order	m.	n.	mf_1	nf_2	IP Frequencies
even	1	1	1kHz	1.8kHz	2.8 and 0.8kHz
odd	2	1	2kHz	1.8kHz	3.8 and 0.2kHz
even	2	2	2kHz	3.6kHz	5.6 and 1.6kHz
odd	1	2	1kHz	3.6kHz	4.6 and 2.6kHz

No component may exceed 75dB below the wanted signal level in amplitude.

Repeat with the OUTPUT switch set to Balanced, and ensure that no component exceeds 65dB below the wanted signal in amplitude.

SECTION 3

PARTS LISTS

CIRCUIT DIAGRAMS

AND

COMPONENT LAYOUTS

ORDERING OF SPARE PARTS

1. To be assured of satisfactory service when ordering replacement parts, the customer is requested to include the following information.

   (a) Instrument type and serial number.

   (b) The type reference of the Assembly in which the particular items is located.

   (c) The Racal Part number and circuit reference of each item being ordered.

   It should be noted that a minimum charge of £10 sterling is applicable to all U.K. orders.

CHAPTER 7

PARTS LISTS

NOTE

Component values are indicated in the Parts List as follows:-

Resistors	Capacitors
Letter 'R' ... ohms	Suffix 'μ' ... microfarads
Letter 'k' ... kilohms	Suffix 'p' ... picofarads
Letter 'M'... megohms	Suffix 'n' ... nanofarads

'FSV' indicates 'factory selected value'.

ATTENUATOR BOARD ASSEMBLY 719-0001

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
Resistors			W		
R1	120k	Carbon Film	¼	5	720-2126
R2	698R	Metal Film	½	1	720-56983
R3	82k	Carbon Film	¼	5	720-2825
R4	787R	Metal Film	½	1	720-57873
R5	47k	Carbon Film	¼	5	720-2475
R6	887R	Metal Film	½	1	720-58873
R7	82k	Carbon Film	¼	5	720-2825
R8	1k	Metal Film	½	1	720-51004
R9	51k	Metal Film	½	2	720-4515
R10	1k13	Metal Film	½	1	720-51134
R11	91R	Metal Film	½	2	720-4912
R12	82R	Metal Film	½	2	720-4822
R13	1k47	Metal Film	½	1	720-51474
R14	1k02	Metal Film	½	1	720-51024
R15	1k02	Metal Film	½	1	720-51024
R16	1k	Metal Film	½	1	720-51004
R17	180k	Carbon Film	¼	5	720-2186
R18	1k47	Metal Film	½	1	720-51474
R19	11R	Metal Film	½	2	720-4112
R20	11R	Metal Film	½	2	720-4112
R21	1k	Metal Film	½	1	720-51004
R22	180k	Carbon Film	¼	5	720-2186
R23	1k47	Metal Film	½	1	720-51474
R24	6R8	Metal Film	½	2	720-4681
R25	5R6	Metal Film	½	2	720-4561
R26	1k47	Metal Film	½	1	720-51474
R27	390k	Carbon Film	¼	5	720-2396
R28	620R	Metal Film	½	2	720-4623
R29	68k	Carbon Film	¼	5	720-2685
R30	562R	Metal Film	½	1	720-55623
R31	27k	Carbon Film	¼	5	720-2275
R32	499R	Metal Film	½	1	720-54993
R33	68k	Carbon Film	¼	5	720-2685
R34	442R	Metal Film	½	1	720-54423
R35	8k2	Metal Film	½	2	720-4824

ATTENUATOR BOARD ASSEMBLY Cont'd

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
R36	412R	Metal Film	$\frac{1}{2}$	1	720-54123
R37	110k	Metal Film	$\frac{1}{2}$	2	720-4116
R38	3k3	Metal Film	$\frac{1}{2}$	2	720-4334
R39	1k	Metal Film	$\frac{1}{2}$	1	720-51004
R40	180k	Carbon Film	$\frac{1}{4}$	5	720-2186
R41	6R8	Metal Film	$\frac{1}{2}$	2	720-4681
R42	5R6	Metal Film	$\frac{1}{2}$	2	720-4561
R43	1k47	Metal Film	$\frac{1}{2}$	1	720-51474
R44	6R8	Metal Film	$\frac{1}{2}$	2	720-4681
R45	5R6	Metal Film	$\frac{1}{2}$	2	720-4561
R46	1k47	Metal Film	$\frac{1}{2}$	1	720-51474
R47	6R8	Metal Film	$\frac{1}{2}$	2	720-4681
R48	5R6	Metal Film	$\frac{1}{2}$	2	720-4561
R49	1k47	Metal Film	$\frac{1}{2}$	1	720-51474
R50	6R8	Metal Film	$\frac{1}{2}$	2	720-4681
R51	5R6	Metal Film	$\frac{1}{2}$	2	720-4561
R52	1k47	Metal Film	$\frac{1}{2}$	1	720-51474
R53	6R8	Metal Film	$\frac{1}{2}$	2	720-4681
R54	5R6	Metal Film	$\frac{1}{2}$	2	720-4561
R55	510R	Metal Film	$\frac{1}{2}$	2	720-45103
R56	1k	Metal Film	$\frac{1}{2}$	1	720-51004
R57	180k	Carbon Film	$\frac{1}{4}$	5	720-2186
R58	1k	Metal Film	$\frac{1}{2}$	1	720-51004
R59	180k	Carbon Film	$\frac{1}{4}$	5	720-2186
R60	1k	Metal Film	$\frac{1}{2}$	1	720-51004
R61	180k	Carbon Film	$\frac{1}{4}$	5	720-2186
R62	1k	Metal Film	$\frac{1}{2}$	1	720-51004
R63	180k	Carbon Film	$\frac{1}{4}$	5	720-2186
R64	681R	Metal Film	$\frac{1}{2}$	1	720-56813
R65	470k	Carbon Film	$\frac{1}{4}$	5	720-2476

ATTENUATOR BOARD ASSEMBLY Cont'd

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
Capacitors			V		
C1	FSV	(330p nominal) Polystyrene			
C2	2200p	Polystyrene		10	721-3224
C3	FSV	(680p nominal) Polystyrene			
Switches					
SW1		Single pole, 11W			723-3202
SW2		Two pole, 10W			723-3200

MAIN CIRCUIT PCB ASSEMBLY 719-0002

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
Resistors			W		
R1	1k	Carbon Film	$\frac{1}{4}$	5	720-2104
R2	1k	Carbon Film	$\frac{1}{4}$	5	720-2104
R3	FSV	Metal Film	$\frac{1}{2}$	2	) Range of
R4	FSV	Metal Film	$\frac{1}{2}$	2	) values 1k to) 1k5
R5	200R	Metal Film	$\frac{1}{2}$	2	720-4203
R6	10R	Metal Film	$\frac{1}{2}$	2	720-4102
R7	6k8	Carbon Film	$\frac{1}{4}$	5	720-2684
R8	100R	Carbon Film	$\frac{1}{4}$	5	720-2103
R9	10k	Metal Film	$\frac{1}{2}$	2	720-4105
R10	1k1	Metal Film	$\frac{1}{2}$	2	720-4114
R11	180k	Carbon Film	$\frac{1}{4}$	5	720-2186
R12	470R	Carbon Film	$\frac{1}{4}$	5	720-2473
R13	1k2	Metal Film	$\frac{1}{2}$	2	720-4124
R14	1k	Carbon Film	$\frac{1}{4}$	5	720-2104
R15	1k8	Metal Film	$\frac{1}{2}$	2	720-4184
R16	100R	Metal Film	$\frac{1}{2}$	2	720-4103
R17	180k	Carbon Film	$\frac{1}{4}$	5	720-2186
R18	1k	Metal Film	$\frac{1}{2}$	2	720-4104
R19	620R	Metal Film	$\frac{1}{2}$	2	720-4623
R20	1k	Metal Film	$\frac{1}{2}$	2	720-4104
R21	1k	Metal Oxide	$\frac{1}{2}$	2	720-3104
R22	3k	Metal Film	$\frac{1}{2}$	2	720-4304
R23	2k	Metal Film	$\frac{1}{2}$	2	720-4204
R24	470R	Carbon Film	$\frac{1}{4}$	5	720-2473
R25	56k	Carbon Film	$\frac{1}{4}$	5	720-2563
R26	4k7	Carbon Film	$\frac{1}{4}$	5	720-2474
R27	1k	Carbon Film	$\frac{1}{4}$	5	720-2104
R28	22R	Carbon Film	$\frac{1}{4}$	5	720-2222
R29	22R	Carbon Film	$\frac{1}{4}$	5	720-2222
R30	47k	Carbon Film	$\frac{1}{4}$	5	720-2475
R31	1k69	Metal Film	$\frac{1}{2}$	1	720-51693
R32	4k7	Carbon Film	$\frac{1}{4}$	5	720-2474
R33	1k	Carbon Film	$\frac{1}{4}$	5	720-2104
R34	47k	Carbon Film	$\frac{1}{4}$	5	720-2475
R35	6k8	Carbon Film	$\frac{1}{4}$	5	720-2684

MAIN CIRCUIT PCB ASSEMBLY Cont'd

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
R36	100R	Carbon Film	$\frac{1}{4}$	5	720-2103
R37	2k2	Metal Film	$\frac{1}{2}$	2	720-4224
R38	2k2	Metal Film	$\frac{1}{2}$	2	720-4224
R39	100k	Carbon Film	$\frac{1}{4}$	5	720-2106
R40	2k7	Carbon Film	$\frac{1}{4}$	5	720-2274
R41	2k7	Carbon Film	$\frac{1}{4}$	5	720-2274
R42	4k7	Metal Film	$\frac{1}{2}$	2	720-4474
R43	100R	Carbon Film	$\frac{1}{4}$	5	720-2103
R44	100R	Carbon Film	$\frac{1}{4}$	5	720-2103
R45	100R	Carbon Film	$\frac{1}{4}$	5	720-2103
R46	1k5	Carbon Film	$\frac{1}{4}$	5	720-2154
R47	6k8	Carbon Film	$\frac{1}{4}$	5	720-2684
R48	1k0	Carbon Film	$\frac{1}{4}$	5	720-2104
R49	82R	Metal Oxide	$\frac{1}{2}$	2	720-3822
R50	1k0	Carbon Film	$\frac{1}{4}$	5	720-2104
R51	100k	Carbon Film	$\frac{1}{4}$	5	720-2106
R52	56R	Metal Oxide	$\frac{1}{2}$	2	720-3562
R53	56R	Metal Oxide	$\frac{1}{2}$	2	720-3562
R54	6k8	Carbon Film	$\frac{1}{4}$	5	720-2684
R55	1k	Carbon Film	$\frac{1}{4}$	5	720-2104
R56	1k	Carbon Film	$\frac{1}{4}$	5	720-2104
R57	FSV	Metal Film	$\frac{1}{2}$	2	Value range 800-1250Ω
R58	6k8	Carbon Film	$\frac{1}{4}$	5	720-2684
R59	100R	Carbon Film	$\frac{1}{4}$	5	720-2103
R60	10k	Metal Film	$\frac{1}{2}$	2	720-4105
R61	1k1	Metal Film	$\frac{1}{2}$	2	720-4114
R62	FSV	Metal Film	$\frac{1}{2}$	2	Value Range 800-1250Ω
R63	200R	Metal Film	$\frac{1}{2}$	2	720-4203
R64	10R	Metal Film	$\frac{1}{2}$	2	720-4102
R65	180k	Carbon Film	$\frac{1}{4}$	5	720-2186
R66	470R	Carbon Film	$\frac{1}{4}$	5	720-2473
R67	1k8	Metal Film	$\frac{1}{2}$	2	720-4184
R68	100R	Metal Film	$\frac{1}{2}$	2	720-4103
R69	1k2	Metal Film	$\frac{1}{2}$	2	720-4124
R70	1k0	Carbon Film	$\frac{1}{4}$	5	720-2104

MAIN CIRCUIT PCB ASSEMBLY Cont'd

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
R71	180k	Carbon Film	$\frac{1}{4}$	5	720-2186
R72	1k	Metal Film	$\frac{1}{2}$	2	720-4104
R73	620R	Metal Film	$\frac{1}{2}$	2	720-4623
R74	1k	Metal Film	$\frac{1}{2}$	2	720-4104
R75	6k8	CarbonFilm	$\frac{1}{4}$	5	720-2684
R76	100R	Carbon Film	$\frac{1}{4}$	5	720-2103
R77	6k8	Carbon Film	$\frac{1}{4}$	5	720-2684
R78	6k8	Carbon Film	$\frac{1}{4}$	5	720-2684
R79	6k8	Carbon Film	$\frac{1}{4}$	5	720-2684
R80 to R83 Incl.	100R	Carbon Film	$\frac{1}{4}$	5	720-2103
R85	470R	Metal Oxide	$\frac{1}{2}$	2	720-3473

Variable Resistors

RV1) RV2) RV3) RV4) RV5)	Not mounted on the p.c.b. Refer to Miscellaneous Components Parts List (page 7-12)				
RV6	100R	Cermet, preset			720-7103
RV7	100R	Cermet, preset			720-7103
RV8	200k	Cermet, preset			720-7206
RV9	100R	Cermet, preset			720-7103
RV10	200k	Cermet, preset			720-7206
RV11	100R	Cermet, preset			720-7103
RV12	200R	Cermet, preset			720-7203
RV13	500R	Cermet, preset			720-7503
RV14	1k	Cermet, preset			720-7104
RV15	1k	Cermet, preset			720-7104
RV16	500R	Cermet, preset			720-7503
RV17	Refer to page 7-12				
RV18	100R	Cermet, preset			720-7103
RV19	100R	Cermet, preset			720-7103
RV20	200k	Cermet, preset			720-7206
RV21	100R	Cermet, preset			720-7103
RV22	200k	Cermet, preset			720-7206
RV23	100R	Cermet, preset			720-7103

MAIN CIRCUIT PCB ASSEMBLY Cont'd

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
Capacitors	F		V		
C1	22µ	Electrolytic	25	-10+50	721-7228
C2	22µ	Electrolytic	25	-10+50	721-7228
C3	0.1µ	Polyester	100	20	721-4106
C4	0.1µ	Polyester	100	20	721-4106
C5	22µ	Electrolytic	25	-10+50	721-7228
C6	0.1µ	Polyester	100	20	721-4106
C7	22µ	Electrolytic	25	-10+50	721-7228
C8	0.1µ	Polyester	100	20	721-4106
C9	470µ	Electrolytic	40	-10+50	721-7479
C10	470µ	Electrolytic	40	-10+50	721-7479
$C11^{a}_{b}$	11000p total	Polyester (selected)			721-9002
$C12^{a}_{b}$	0.11µ total	Polyester (selected)			721-9003
$C13^{a}_{b}$	Same as C16a/b				
$C14^{a}_{b}$	Same as C11a/b				
$C15^{a}_{b}$	Same as C12a/b				
$C16^{a}_{b}$	1.1µ total	Polyester (selected)			721-9004
C17	47p	Ceramic	500	10	721-1472
C18	FSV	Ceramic (value range 2.2-10pF)			
C19	0.1µ	Polyester	100	20	721-4106
C20	0.1µ	Polyester	100	20	721-4106
C21	100µ	Electrolytic	25	-10+50	721-7109
C22	FSV	Ceramic (value range 2.2-10pF)			
C23	1000µ	Electrolytic	25	-10+50	721-71010
C24	1000µ	Electrolytic	25	-10+50	721-71010
C25	22µ	Electrolytic	25	-10+50	721-7228
C26	0.1µ	Polyester	100	20	721-4106
C27	47p	Ceramic	500	10	721-1472
C28	22µ	Electrolytic	25	-10+50	721-7228
C29	22p	Ceramic	500	10	721-1222
C30	.01µ	Polyester	400	20	721-4105

MAIN CIRCUIT PCB ASSEMBLY Cont'd

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
C31	22p	Ceramic	500	10	721-1222
C32	47p	Ceramic	500	10	721-1472
C33	0.01µ	Ceramic	50	20	721-1105
C34	47p	Ceramic	500	10	721-1472
C35	22µ	Electrolytic	25	-10+50	721-7228
C36	22µ	Electrolytic	25	-10+50	721-7228
C37	470µ	Electrolytic	40	-10+50	721-7479
C38	470µ	Electrolytic	40	-10+50	721-7479
C39	100µ	Electrolytic	25	-10+50	721-7109
C40	0.1µ	Polyester	100	20	721-4106
C41	0.1µ	Polyester	100	20	721-4106
C42	22µ	Electrolytic	25	-10+50	721-7228
C43	22µ	Electrolytic	25	-10+50	721-7228
C44	0.1µ	Polyester	100	20	721-4106
C45	0.1µ	Polyester	100	20	721-4106
C46	22µ	Electrolytic	25	-10+50	721-7228
C47	0.1µ	Polyester	100	20	721-4106
C48	0.1µ	Polyester	100	20	721-4106
C49a, C49b	1047p total	Polyester (selected)			721-9001
C50a, C50b	11,000p total	Polyester (selected)			721-9002
C51a, C51b	0.11µ total	Polyester (selected)			721-9003
C52a, C52b	Same as C49a/b				
C53a, C53b	Same as C50a/b				
C54a, C54b	Same as C51a/b				
C55	47p	Ceramic	500	10	721-1472
C56	FSV	Ceramic			
C57	220p	Ceramic	500	10	721-1223
C58	22p	Ceramic	500	10	721-1222
C59	.01µ	Ceramic	50	20	721-1105
C60	.01µ	Ceramic	50	20	721-1105

MAIN CIRCUIT PCB ASSEMBLY Cont'd

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
C61	.01µ	Polyester	50	20	721-4105
C62	.01µ	Polyester	50	20	721-4105
C63	.01µ	Polyester	50	20	721-4105
C64	.01µ	Polyester	50	20	721-4105
C65	.01µ	Polyester	50	20	721-4105
C66	.01µ	Polyester	50	20	721-4105
C67	.01µ	Ceramic	25	-20+80	721-1105
C68	22µ	Electrolytic	25	-10+50	721-7228
C69	470p	Ceramic	500	10	721-1473
C70	10p	Ceramic	500	10	721-1102
C71	10p	Ceramic	500	10	721-1102
C72	10p	Ceramic	500	10	721-1102
Diodes					
D1		Rectifier, bridge 200V 1A	WO2		722-1010
D2		Rectifier, bridge 200V 1A	WO2		722-1010
D3		Silicon, general purpose	IN4148		722-1020
D4		Silicon, general purpose			722-1020
D5		Silicon, general purpose			722-1020
D6		Silicon, general purpose			722-1020
D7		Silicon, general purpose			722-1020
Transistors					
Q1		Silicon, npn (2N3904)			722-6201
Q2		Silicon, npn (2N3904)			722-6201
Q3		Silicon, npn (2N3904)			722-6201
Q4		Silicon, pnp (2N3906)			722-6101
Q5a/b		Dual Silicon, npn (LM114H/LM394H)			722-6303
Q6		Silicon, pnp (2N2905A)			722-6102
Q7		Silicon, pnp (2N2905A)			722-6102
Q8		Silicon, npn (BFY51)			722-6202
Q9		Silicon, npn (BFY51)			722-6202
Q10		Silicon, npn (2N3904)			722-6201
Q11		Silicon, pnp (2N3906)			722-6101
Q12		Silicon, pnp (2N3906)			722-6101

MAIN CIRCUIT PCB ASSEMBLY Cont'd

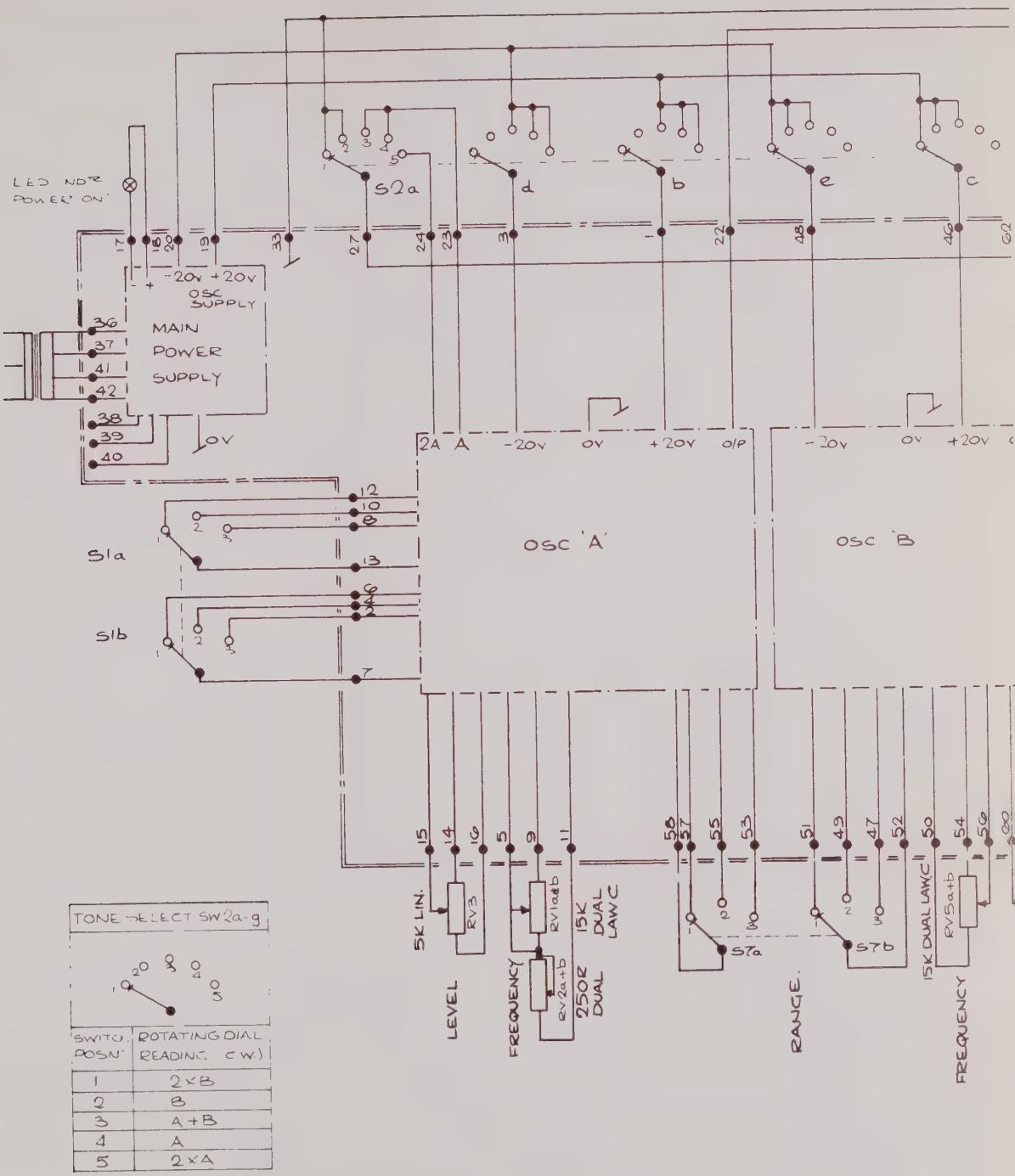
Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
Integrated Circuits					
IC1		Voltage reg +15V 100mA (78L15)			722-5003
IC2		Voltage reg -15V 100mA (79L15)			722-5103
IC3		Op. Amp (LM318H/AD518JH)			722-5001
IC4		Op. Amp (LM318H/AD518JH)			722-5001
IC5		Voltage ref +20V 500mA (78M20)			722-5013
IC6		Voltage reg -20V 500mA (79M20)			722-5113
IC7		Voltage reg +15V 100mA (78L15)			722-5003
IC8		Voltage reg -15V 100mA (79L15)			722-5103
IC9		Op. Amp (LM318H/AD518JH)			722-5001
IC10		Op. Amp (LM318H/AD518JH)			722-5001
Miscellaneous					
TH1		Thermistor (ITT RA53)			720-9001
TH2		Thermistor (ITT RA53)			720-9001
FS2	500mA	Fuselink 20 x 5 mm quick blow			723-0014
FS3	500mA	Fuselink 20 x 5 mm quick blow			723-0014
		Fuseholder for FS2 and FS3. PCB type			723-0013

MISCELLANEOUS COMPONENTS

NOTE: The following components are mounted in various parts of the instrument other than on a p.c.b.

Cct. Ref.	Description			Racal Part Number
	Resistors			
RV1	15k	dual potentiometer, w.w., law C	Front Panel	720-6003
RV2	250R	dual potentiometer, w.w.,	Front Panel	720-6001
RV3	5k	linear potentiometer, cermet	Front Panel	720-6002
RV4	5k	linear potentiometer, cermet	Front Panel	720-6002
RV5	15k	dual potentiometer, w.w., law C	Front Panel	720-6003
RV17	50R	trim potentiometer, cermet		720-7502
R84	91R	Fixed, metal film $\frac{1}{2}$ 2%		720-4912
	Capacitor			
C69	470p	Ceramic		721-1473
	Switches*			
S1	Switch 2P 3W		Front Panel	723-3203
S2	Switch 8P 5W		Front Panel	723-3204
S3	Switch toggle, mains, 250V 3A		Front Panel	723-3221
S4	Switch 3P c/o		Front Panel	723-3224
S7	Switch 2P 3W		Front Panel	723-3203
S8	Switch, slide, DPCO, voltage selector			723-3220
	Sockets and Terminals			
SK1	50R	BNC		723-5000
SK2	50R	BNC		723-5000
	Terminals, BAL O/P, red			723-5001
	Terminal, earth, black			723-5002
	Mains input filter/socket			723-3222
	Indicators			
LP1	l.e.d., power on,			722-7001
M1	Meter, 1mA f.s.d.			717-0001
	Transformers			
	Transformer, toroidal mains			723-6000
	Transformer, toroidal output			723-6001
	Fuses			
FS1	125mA, 20 x 5 mm, antisurge (200-250V)			723-0043
	250mA, 20 x 5 mm, antisurge (90-130V)			723-0031
	Fuseholder for FS1 (rear panel)			723-0044

*For switches SW1 and SW2 (Fig.5) refer to page 7-4.

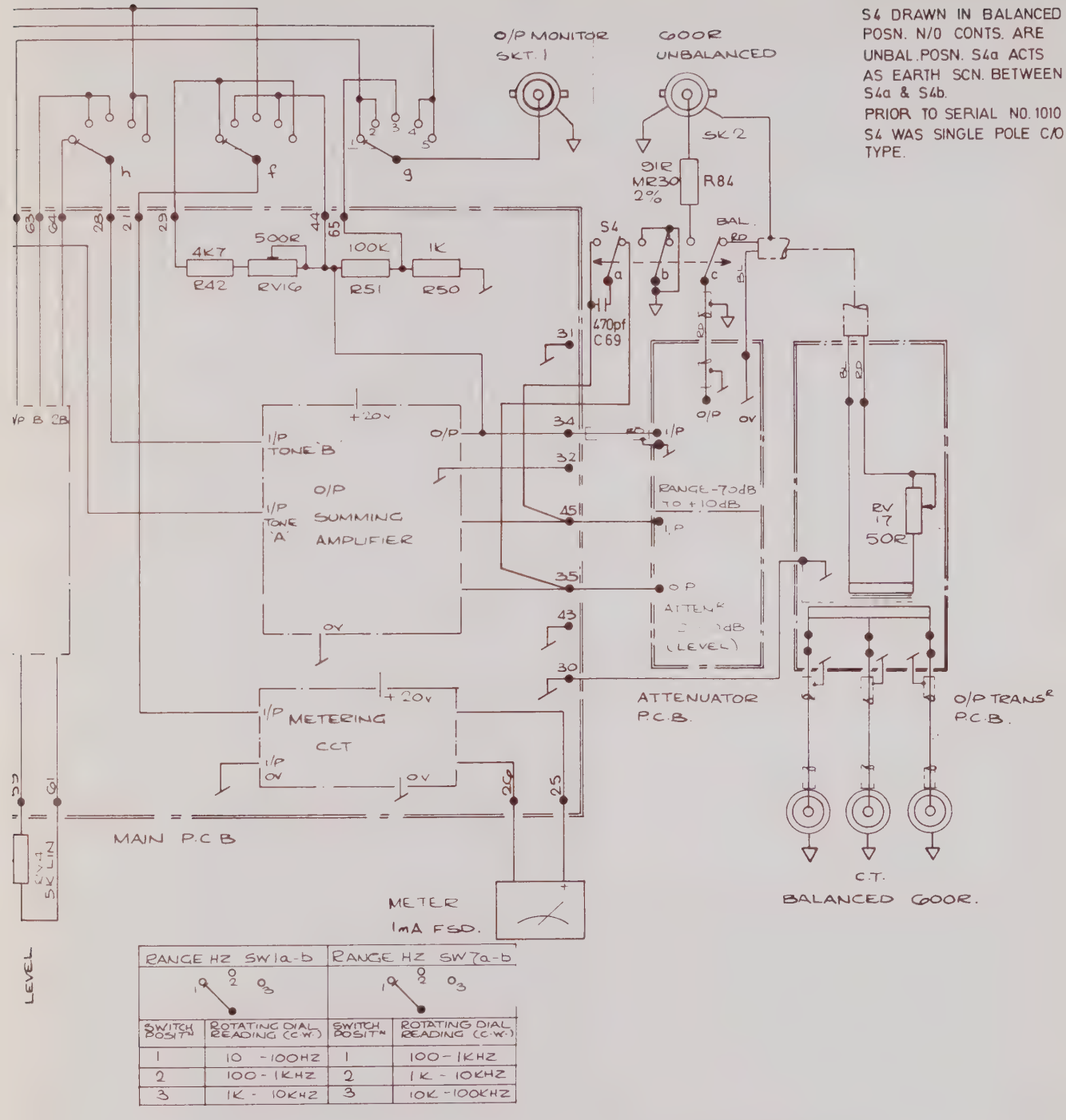


TONE SELECT SW2a-g

SWITCH POSN	ROTATING DIAL READING (CW)
1	2×B
2	B
3	A+B
4	A
5	2×A

RACAL

WOH 8294	9083 SHT 2
P 1	

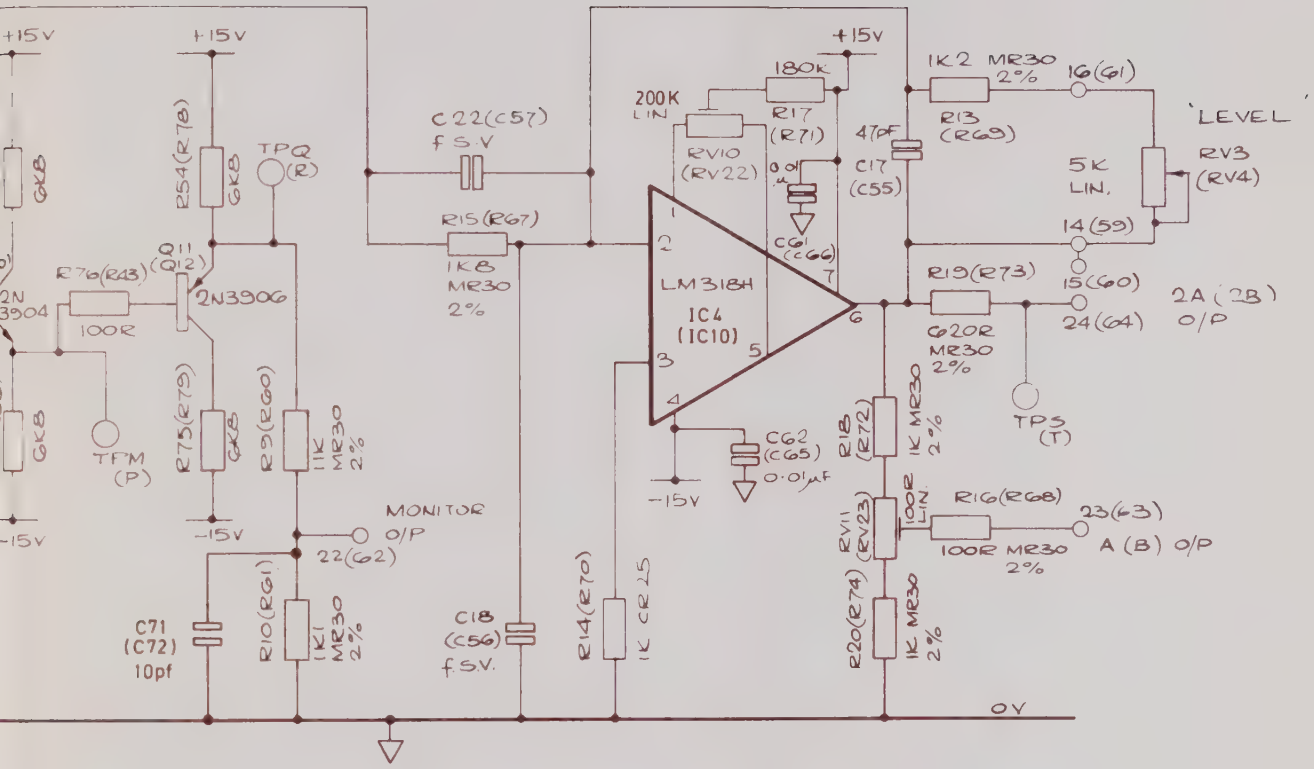


RANGE HZ SW1a-b		RANGE HZ SW7a-b	
SWITCH POSITN	ROTATING DIAL READING (C.W.)	SWITCH POSITN	ROTATING DIAL READING (C.W.)
1	10 - 100HZ	1	100 - 1KHZ
2	100 - 1KHZ	2	1K - 10KHZ
3	1K - 10KHZ	3	10K - 100KHZ

Interconnection Diagram : 9083 Fig. 1

RACAL

WOH 8294	719-0002 SHT.4
P	1

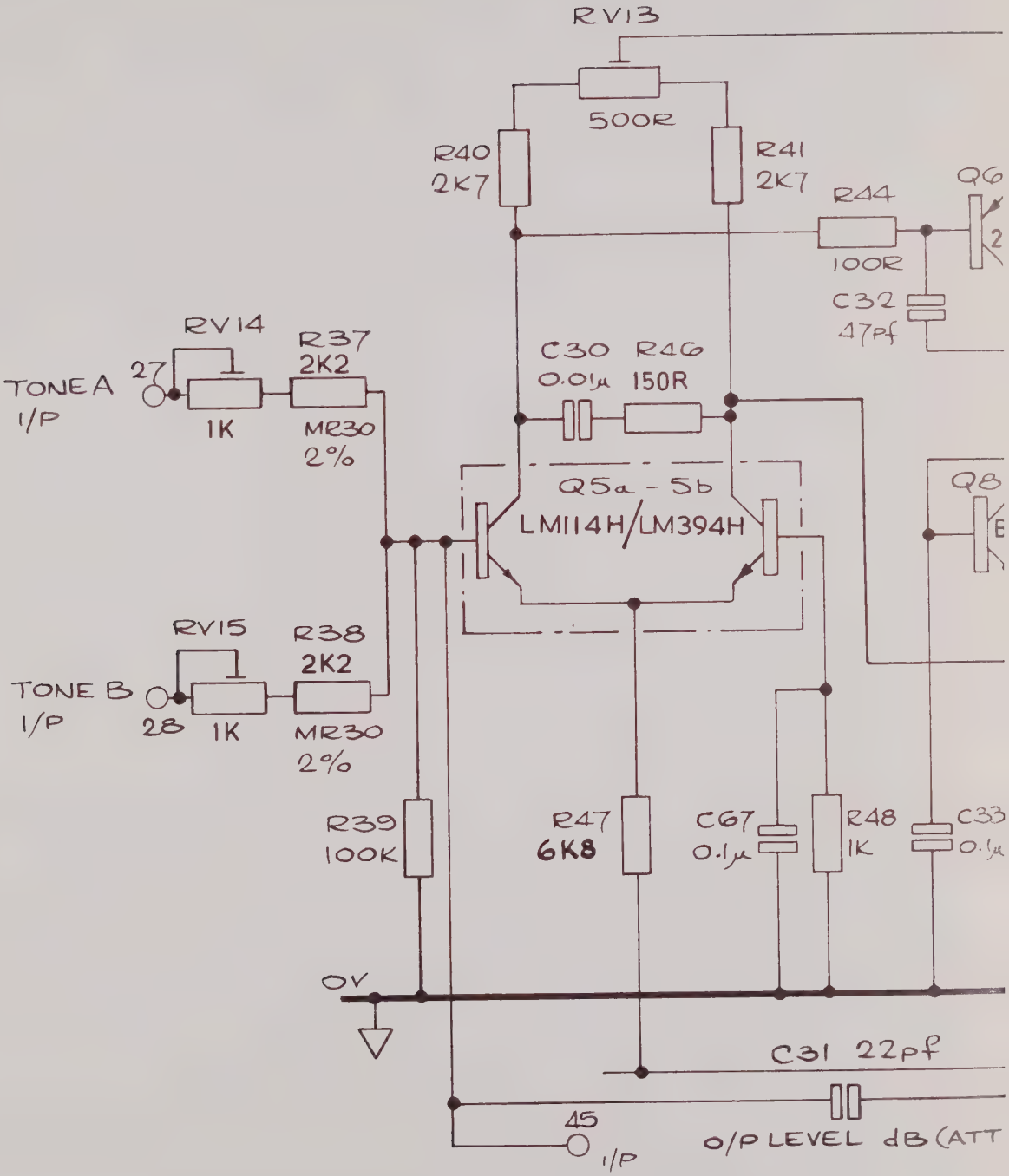


RV1a-b (R5a-b) FREQUENCY A & B
RV 2a-b FREQUENCY FINE TUNE A TONE ONLY.
COMPONENT REF. Nº IN BRACKETS . FOR B TONE

RANGE Hz SW1a-b		RANGE Hz SW 7a-b	
SW' POSN	ROTATING DIAL READING (C.W.)	SW' POSN.	ROTATING DIAL READING (C.W.)
1	10-100HZ	1	100-1KHZ
2	100-1KHZ	2	1K-10KHZ
3	1K-10KHZ	3	10K-100KHZ

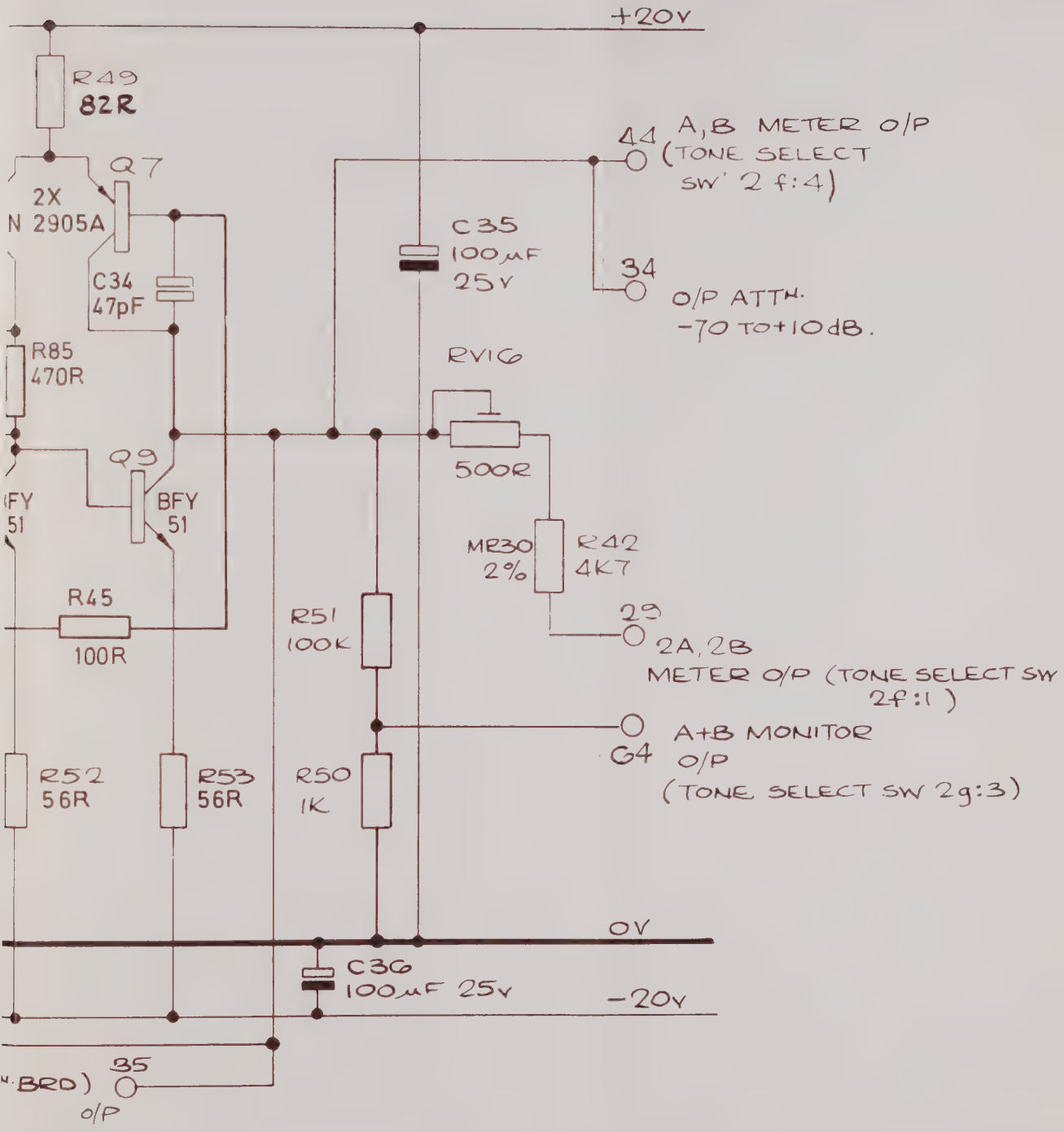
Circuit : Oscillator
And Buffer Amplifier

Fig. 2



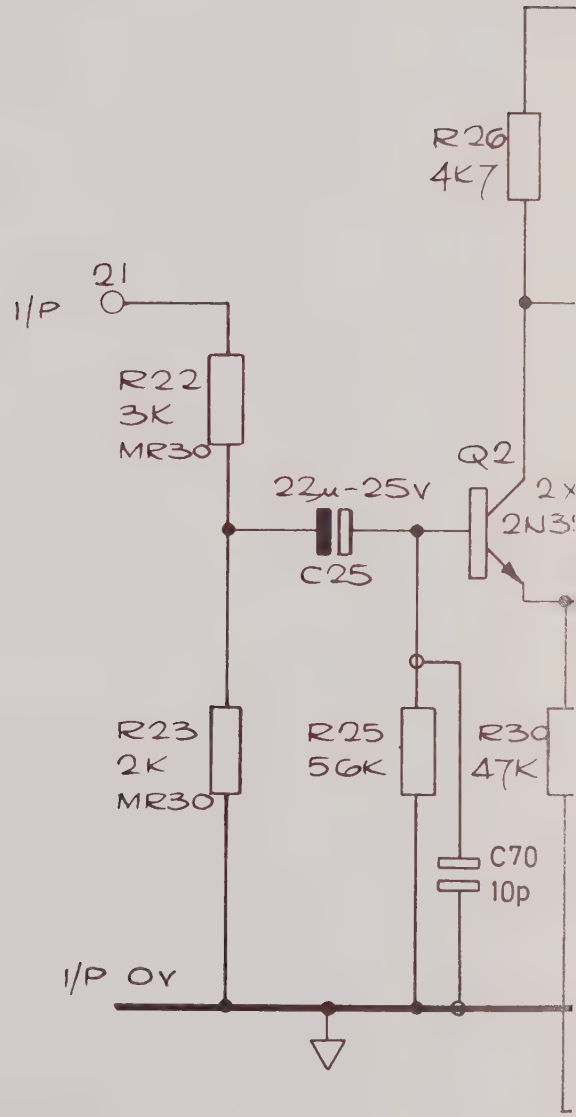
RACAL

WOH 8294	719-0002 SHT.3	
P 1 2 3		



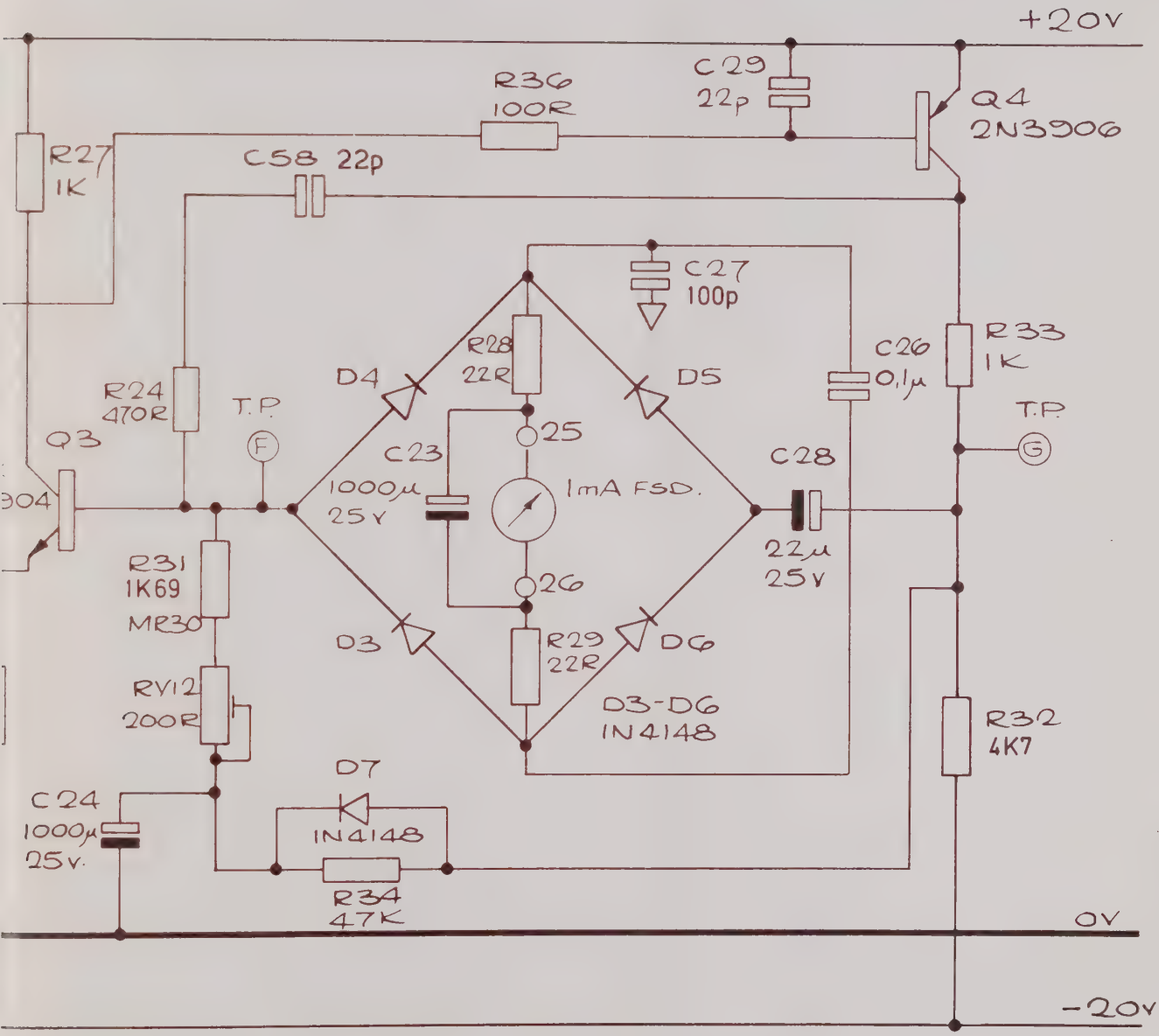
Circuit : Output
Summing Amplifier

Fig. 3



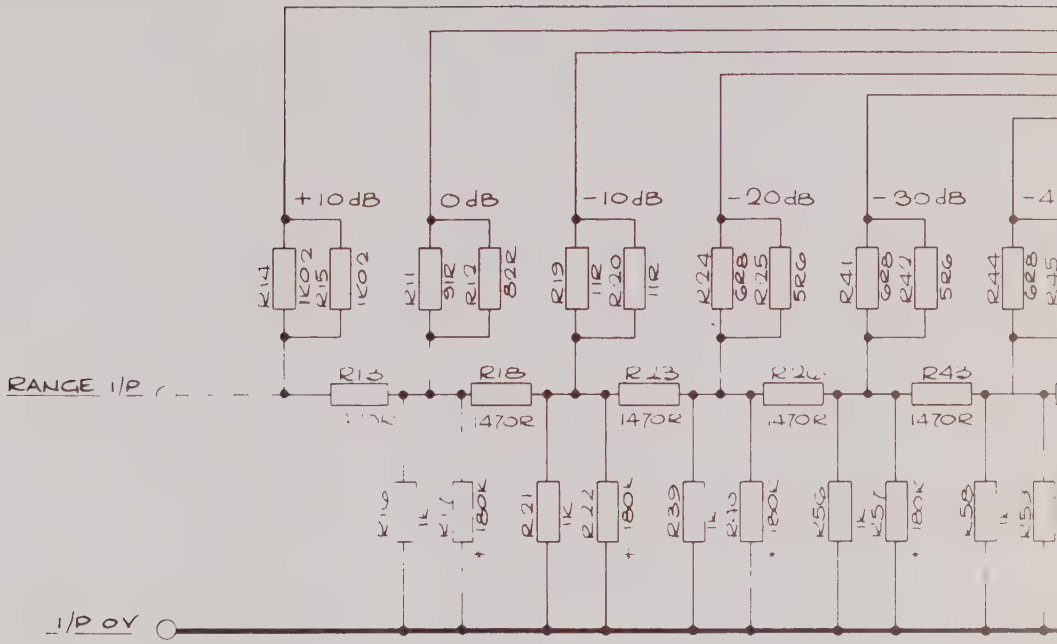
RACAL

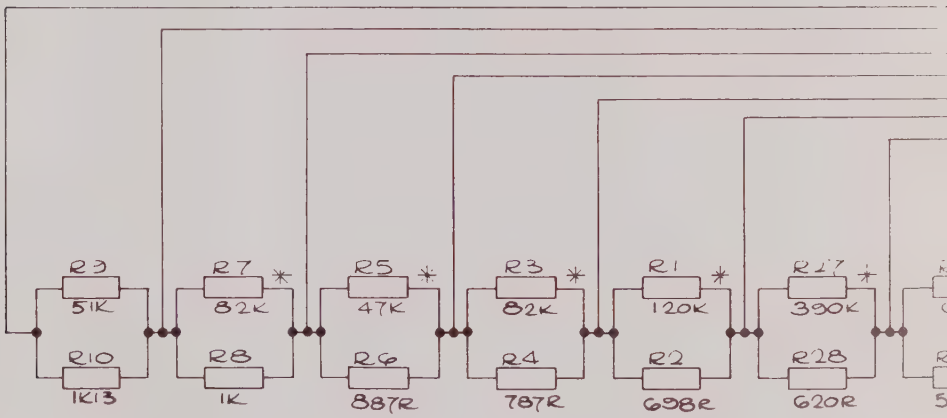
WOH 8294	719-002 SHT. 2
P 1 2	



Metering Circuit

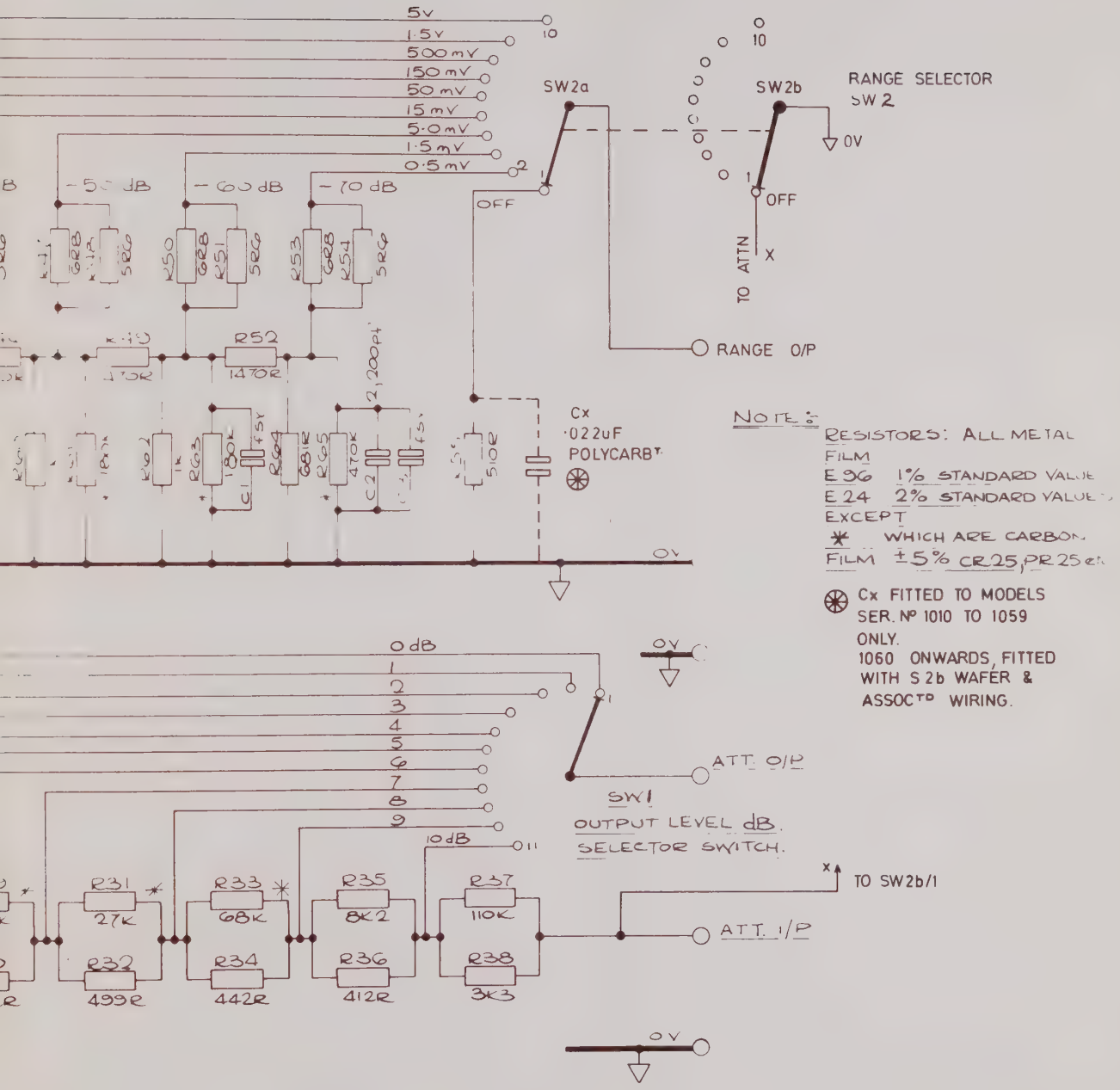
Fig. 4



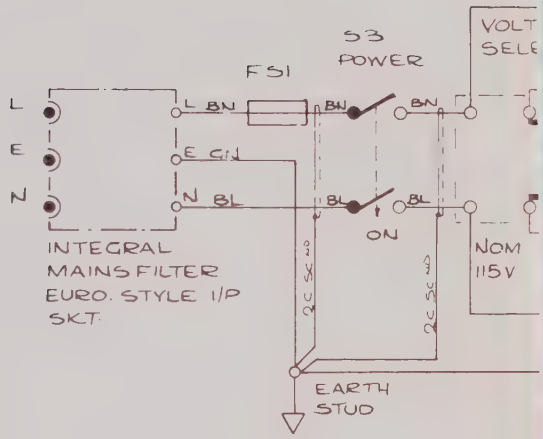


RACAL

WOH 8294	719-0001 SHT. 2	
P	1	



Circuit: Attenuator Output Level and Range Selector Board Fig. 5

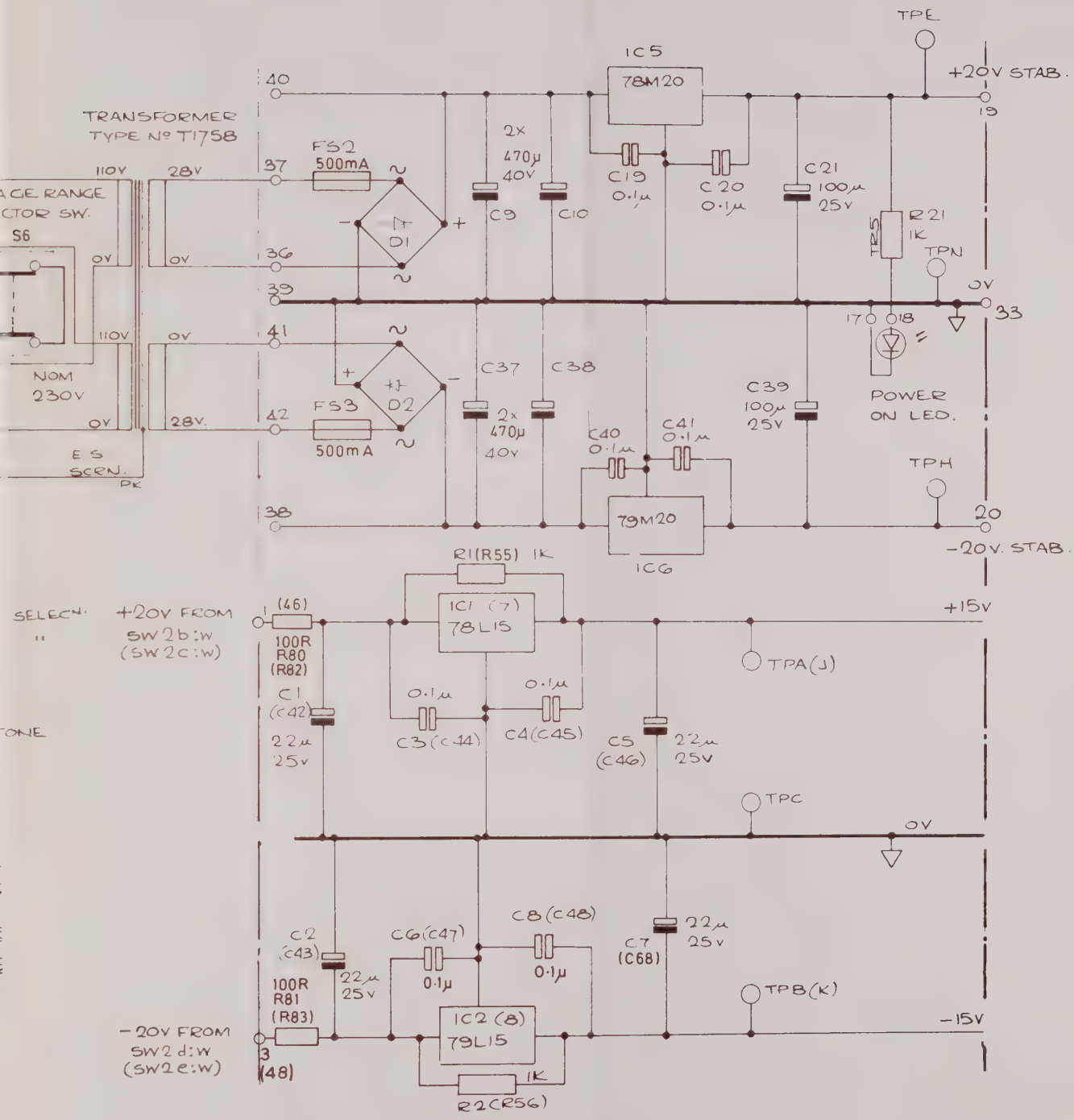


FS1 – 125 mA. ANTI-SURGE FOR 230V. NOM
· 250 mA. " " " 115 V. "

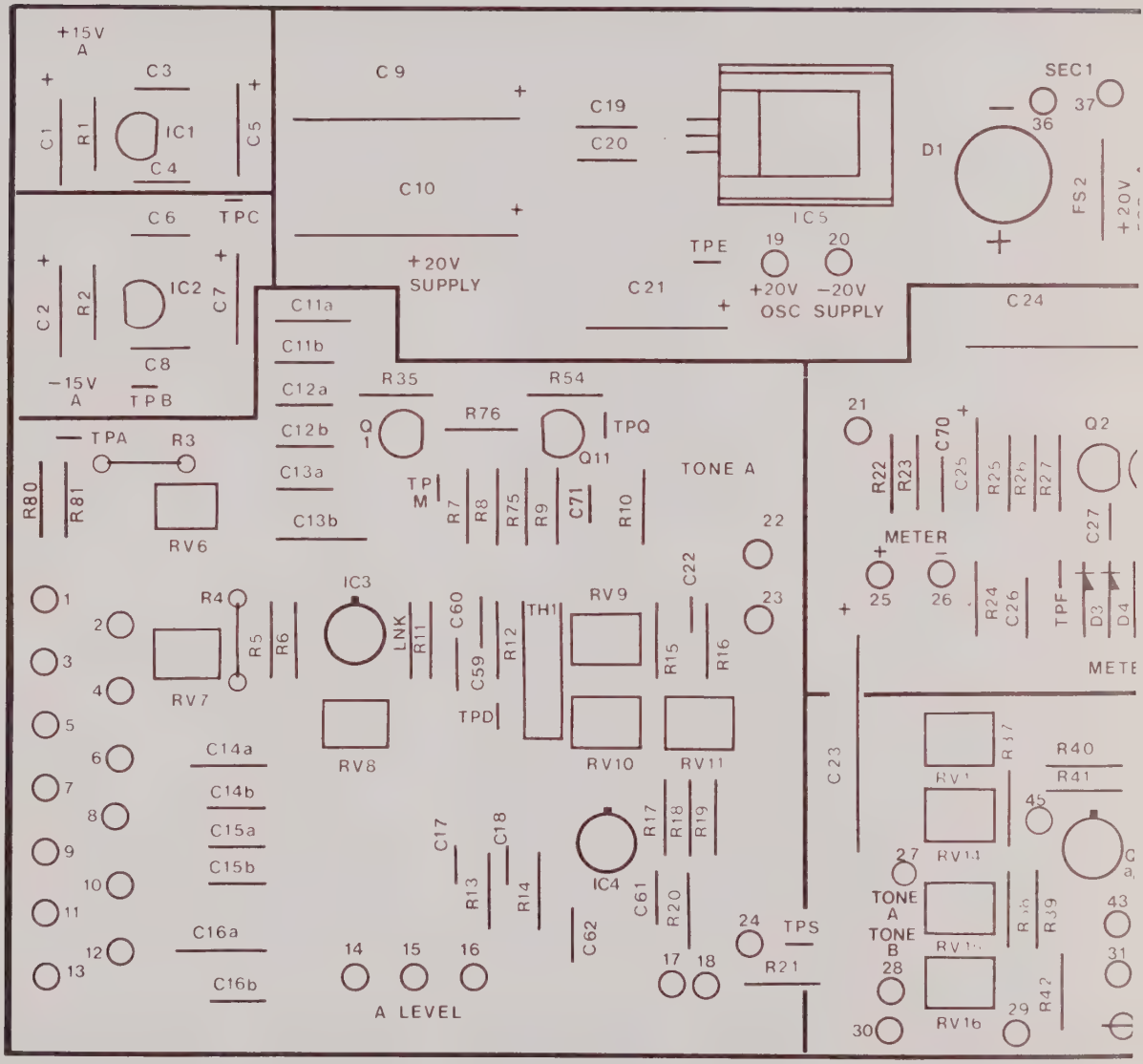
FS2 – 500 mA QUICK BLOW.

FS3 - 500mA QUICK BLOW.

COMP. REF Nº IN BRACKETS FOR B 7

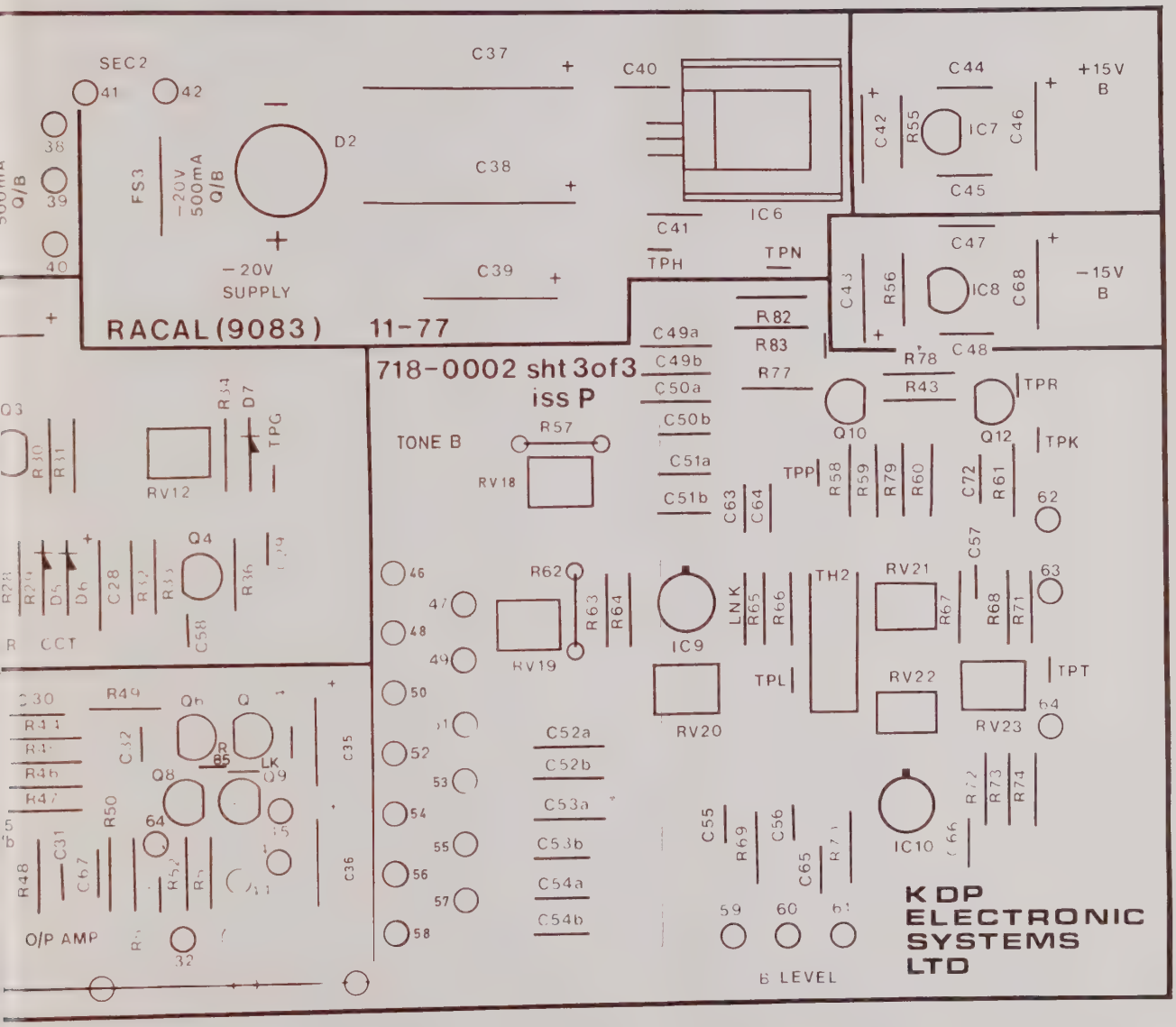


Circuit : Power Supply Fig. 6



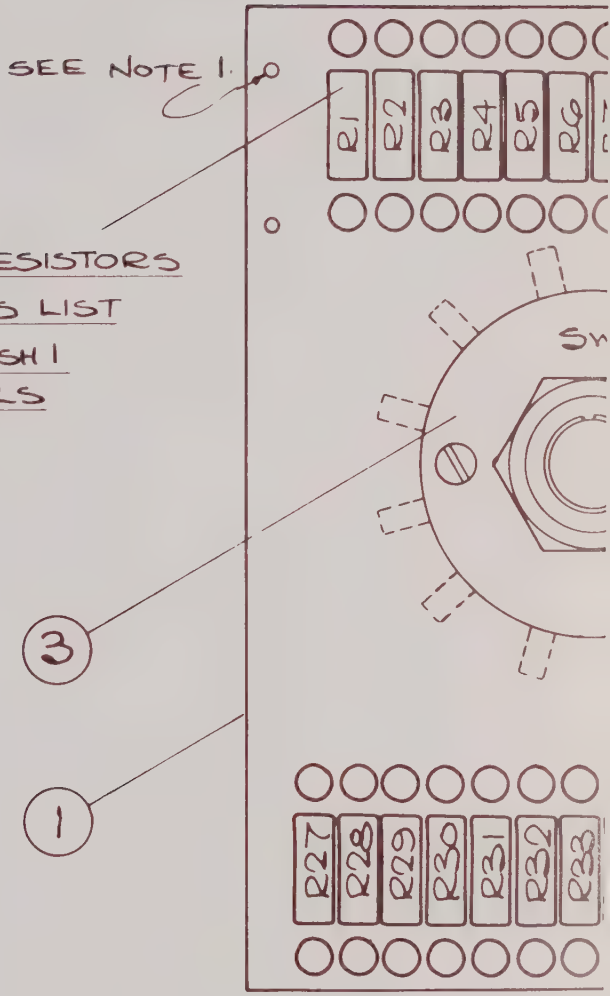
RACAL

WOH 8294	718-0002 SHT. 3
P 1	2



Component Layout :
Main PCB Assembly

Fig. 7



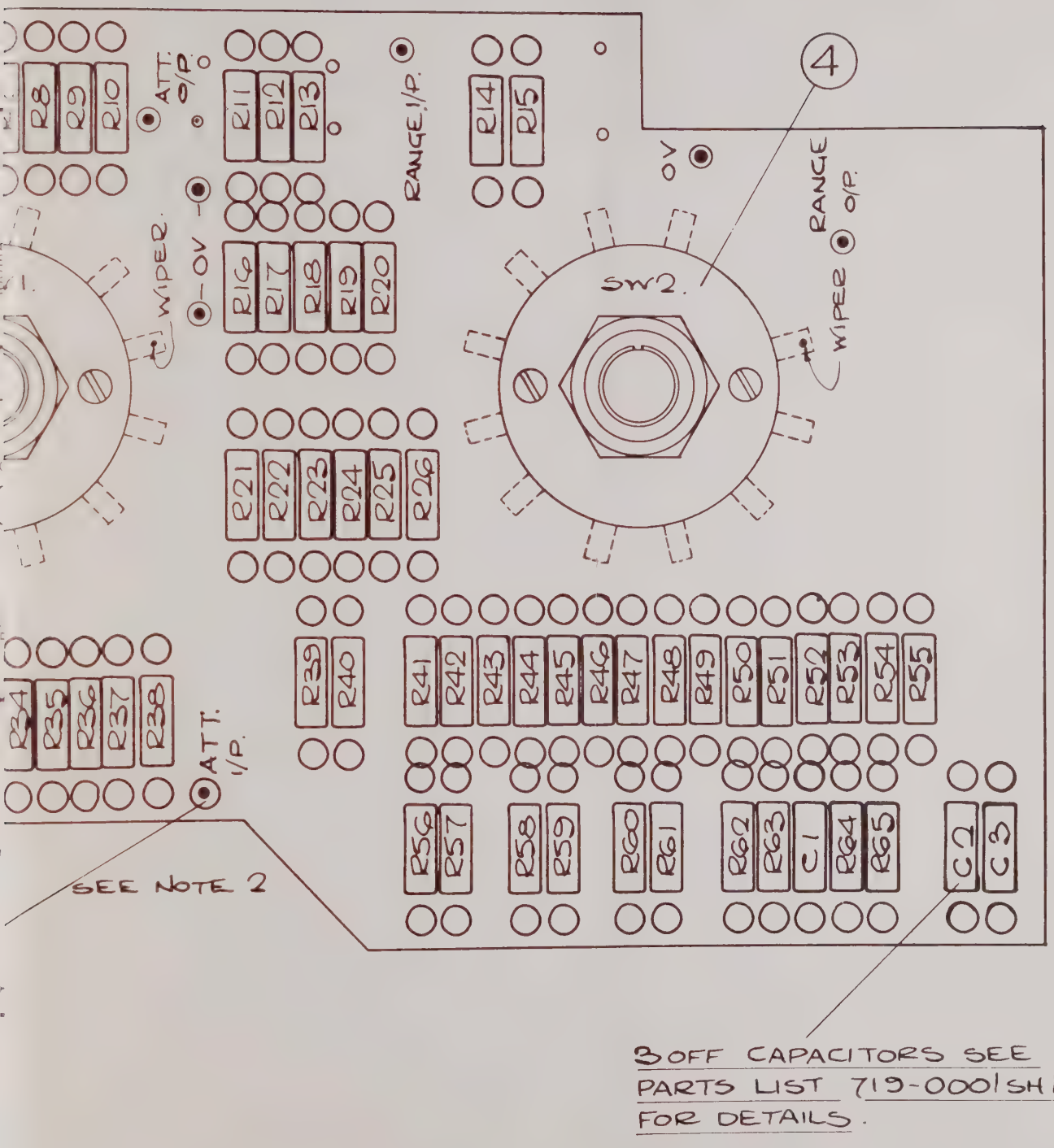
NOTE:- 1. 6 HOLES FOR LASHING SCRWS. CABLES TO P.C.B.

2. ALL I/P & O/P PINS THUS ◉ TO BE MOUNTED ON TRACK SIDE OF P.C.B.

2

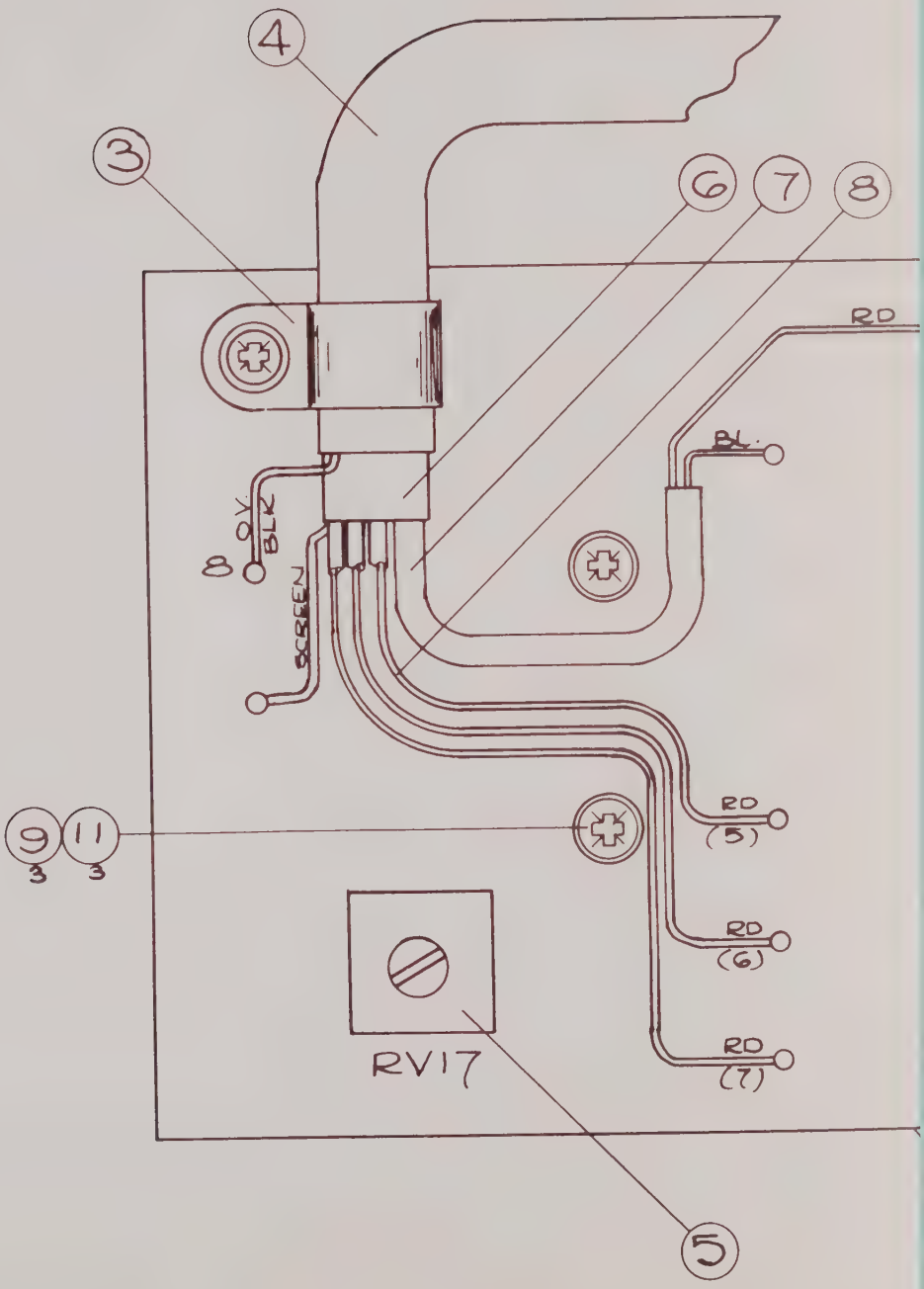
RACAL

WOH 8294	719-0001 SHT.1
P	



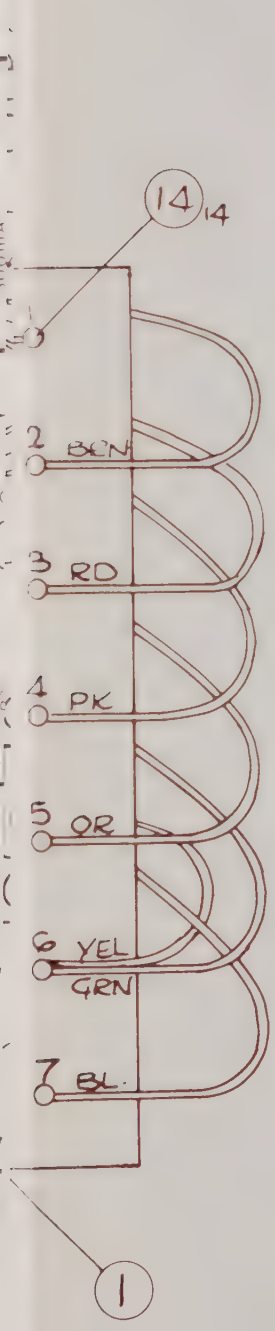
Component Layout :
Attenuator PCB

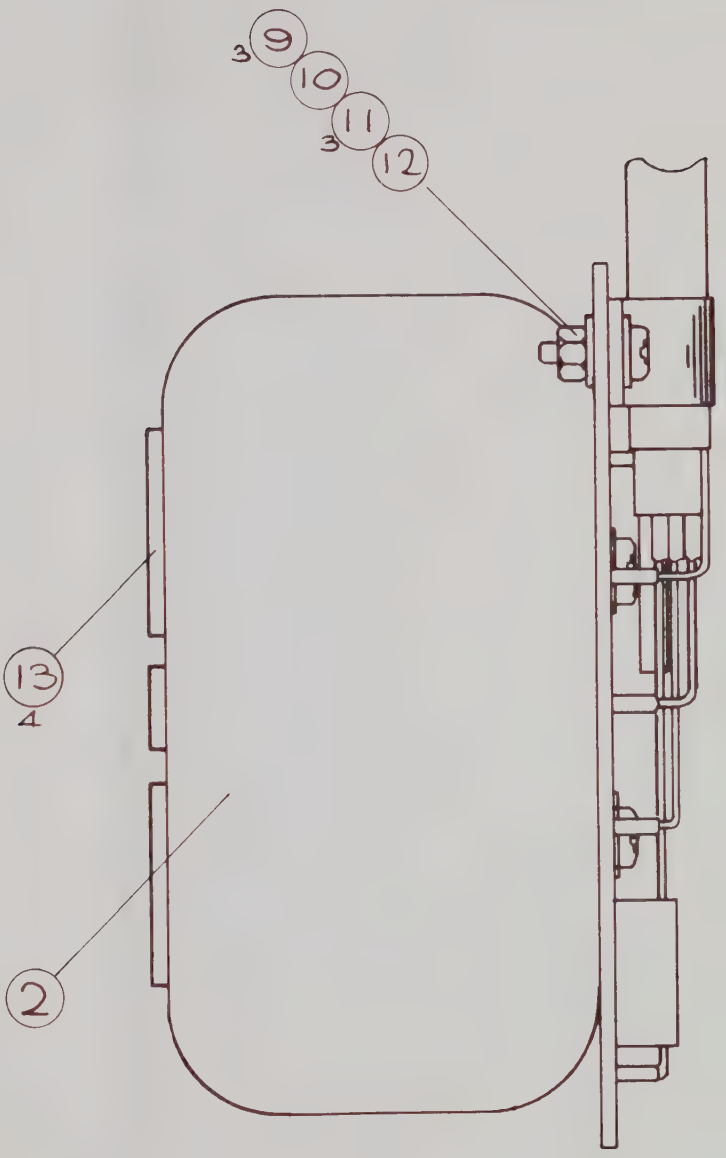
Fig. 8



RACAL

WOH 8294	719-0003
P	





Component Layout : Output Transformer Assembly

Fig. 9

SECTION 4

APPENDICES

AND

CHANGE INFORMATION

MP MASTER
MA36185